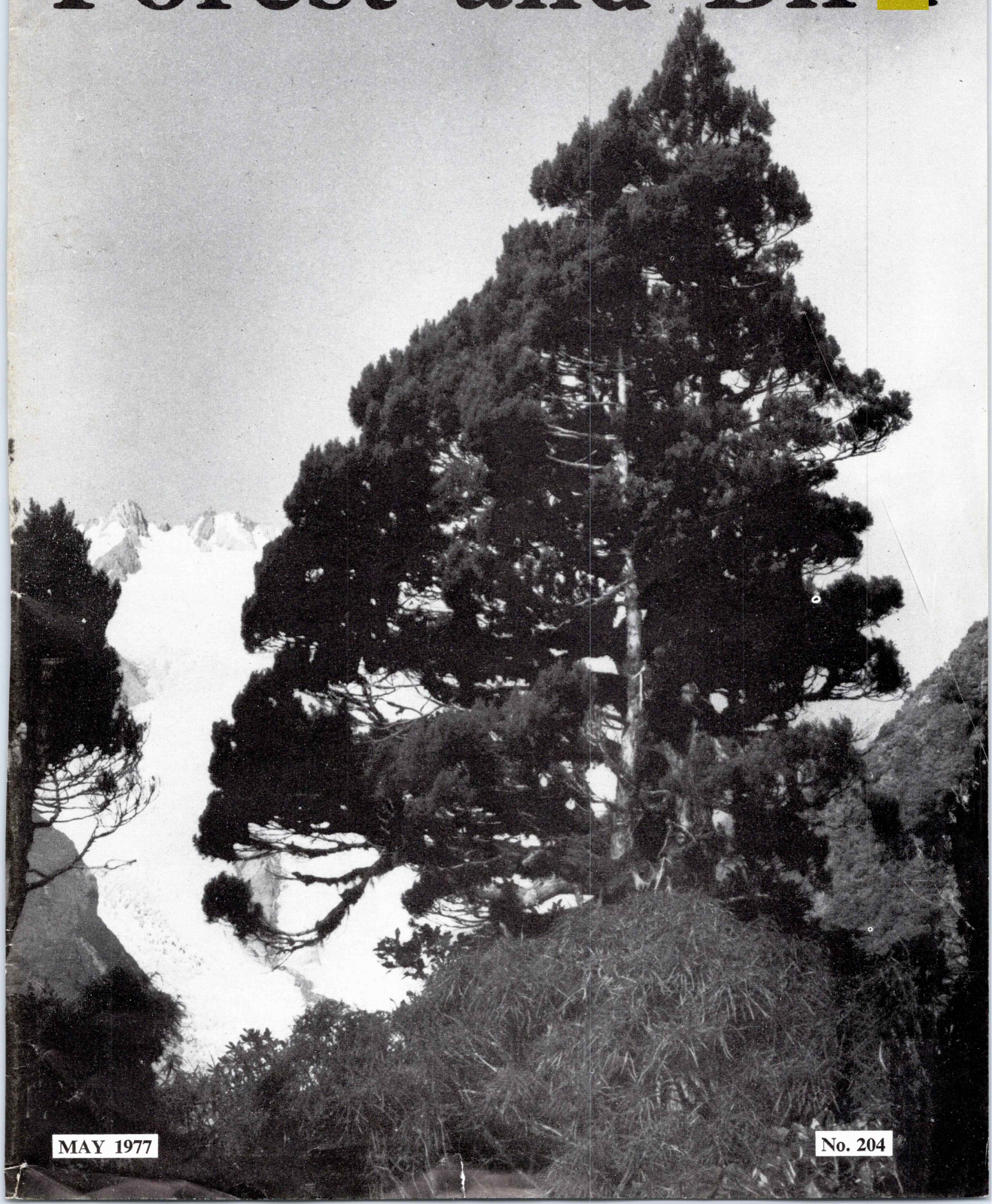


Forest and Bird



MAY 1977

No. 204



Wildlife Service photo by L. J. Richards

The tiny rock wren, one of the New Zealand wrens, is an uncommon bird and lives in the South Island, usually above the bushline, in mountain country from Nelson to Fiordland. It generally frequents rock tumblers and from this habit its name has been derived.

Forest and Bird

Journal of the Royal Forest and Bird Protection Society
of New Zealand Inc.

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COVER: Mountain cedars by the track up to Alex Knob (1307 m) have the magnificent backdrop of the Franz Josef Glacier behind them. Along this popular track is an interesting altitudinal sequence of vegetation, the cedars growing at a height of just over 1000 m. David E. Harding photo.

Contributors to *Forest and Bird* may express their opinions on contentious issues. Those opinions are not necessarily the prevailing opinion of the Royal Forest and Bird Protection Society.

Registered at P.O. Headquarters,
Wellington, as a magazine.

Personal commitment

FINANCING conservation battles is a current problem. Usually the person or group that takes the initiative either does not have the money or is not prepared to pay. In some cases it is entirely appropriate that the people taking the action should pay for it: for example, where the issue involves their own property values or immediate locality.

However, many cases arise from an informed concern for wide issues. You will immediately think of energy problems and the use of native forests. In these matters where is the fighting fund to come from? Our Society has always considered that its resources are available for a crisis. Today crises seem to arise in varying sizes almost daily. Our capacity is stretched. Like most New Zealanders, we live beyond our means.

I have seen the suggestions made to the Environmental Council; \$60,000 of public funds may be made available to the conservation movement. Mr Venn Young, the Minister for the Environment, is sympathetic, but short of money. If money is available, priority is to be given to helping fight specific battles rather than setting up administration. I sincerely hope that this will be so. To do otherwise would be to give conservationists the kiss of bureaucracy.

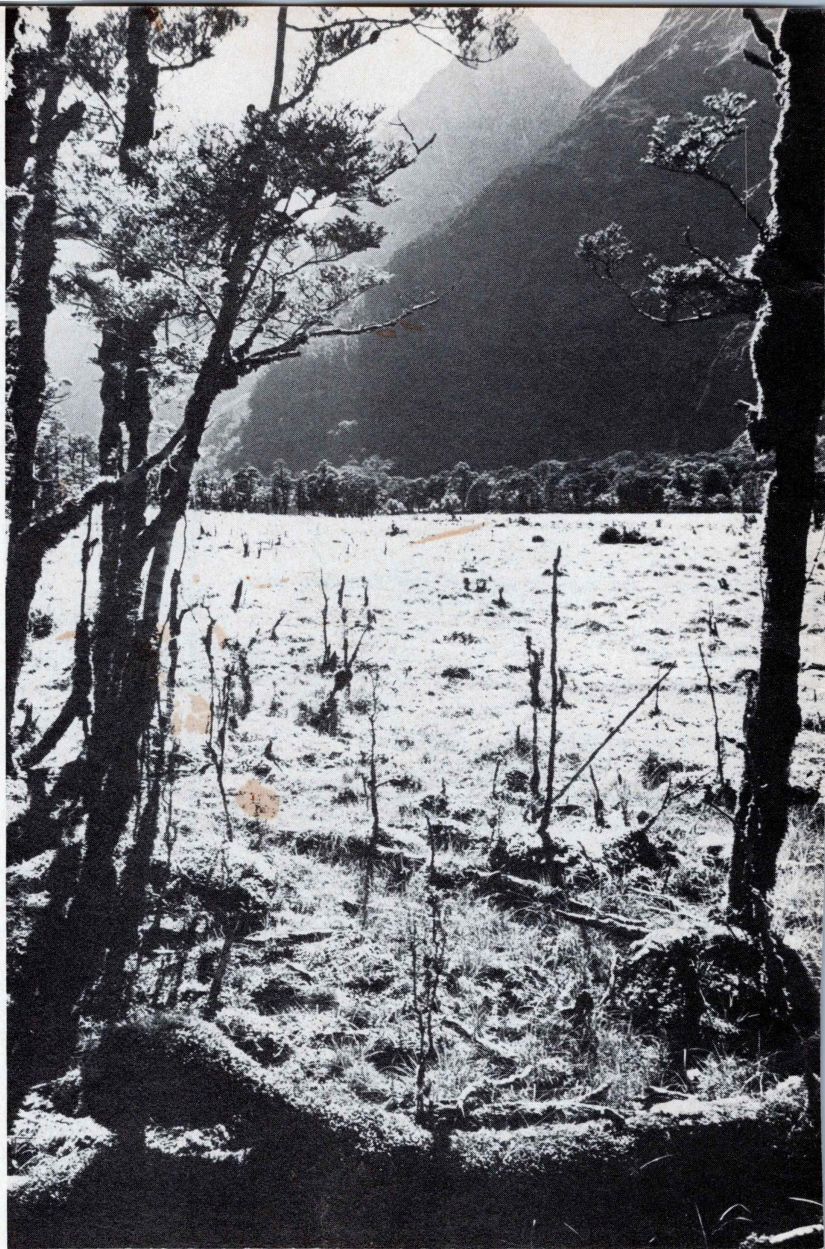
Though I have no real fears that Government money would adversely affect the motivation of the recipients, I firmly believe that in the great battles that face mankind over the use of natural resources personal commitment is essential. This includes financial commitment.

—A. A. T. Ellis, *President.*

Red deer and wapiti threaten Fiordland National Park

DEER and wapiti for many years have been a problem in Fiordland National Park, which they move through inexorably, feeding on the forest undergrowth. Whole habitats for native birds and insects are disappearing, and erosion effects on these steep, fiordland mountains are reaching serious proportions. Moreover, selective browsing by these animals is resulting in palatable plant species being eaten to extinction in large areas of the park and the forest plant association being changed so that unpalatable species predominate.

NEW ZEALAND'S national parks were set up "for the purpose of preserving in perpetuity—for the benefit and enjoyment of the public—areas of New Zealand that contain scenery of such distinctive quality or natural features so beautiful or unique that their preservation is in the national



Wapiti damage in Nitz Valley.

interest." The National Parks Act requires, among other things, "that, as far as possible, native flora and fauna are preserved and introduced flora and fauna exterminated."

This change to the plant associations caused by browsing and the increasing effects of erosion induced a party to visit and inspect the most damaged regions of the park in March. The group comprised Mr L. E. Henderson, a vice-president of the Society

and a member of the Fiordland National Park Board; Mr W. Sander, the chief park ranger; Mr Alan Knowles, science reporter of the "Press", Christchurch; and myself.

The area inspected lay between Te Anau township, George Sound, and Yates Point (north of Milford Sound). This area included the 242 000 hectares now occupied by the wapiti and is surrounded by heavily infested red deer country.

By
David Collingwood,
National
Conservation Officer

So much damage was visible in this country that an examination of the habits of the wapiti (elk) in his home in North America is pertinent.

Wapiti in America

In north-west Wyoming is an area based on a set of sharp, jagged mountains, known as the Tetons, and a sage- and grass-covered valley below, which is 80 km long and 12 km wide and known as Jackson Hole. Today the city and resort town of Jackson has been established on top of the elk's ancient migratory trail and winter habitat.

For over 300 years white men have sold the meat, made rugs of the hide and hung antlers on their walls, and have changed the browsing lands to crops.

Wapiti hinds on the Catseye Ridge.

Today about 40 000 elk in two herds live in the area. Every winter when the deep winter snows come they leave the high mountain ranges and migrate down the 120-km trail to the lands near Jackson, which have been set up as a national elk refuge and parkland nearby. When spring comes they leave the area and follow the trail, browsing along the receding snowline, back for the summer on the high mountain lands.

The area is pine tree country, with the lodge pole—a slender straight tree growing to a height of 25 m—in dense stands as far as the eye can see. There are grasslands in the valleys and hidden forest meadows, which are browsed by the elk.

Generally the elk will follow the same route year after year. They jump fences at the same spot again and again; in moving down from the highlands they will wait until the surface freezes on the lakes and rivers and then cross.

One of the herds is fed with pellets during the winter in

the 11 300 hectares of the national elk refuge, as otherwise the grasses and ground cover would be ruined by the hungry elk's browsing appetite. The other herd is free in the forests in the region.

Land pressures and farming and city developments have changed the habitat of the elk, and they are a pest. Because they are still multiplying, they have to be regularly culled for their own survival, and each winter, by agreement, licences are issued—about 2500 of them—for the harvest of about 500 head of elk, and so the cull is a regular control on increase in numbers.

So what have we?—40 000 wapiti in an area of Wyoming being regularly culled and still indulging in their migratory walk from Jackson Hole and the national refuge to the grand Teton mountains.

New Zealand experience

What does this mean for us in New Zealand? We don't really know how many wapiti are in Fiordland National



Park, for they have hybridised with the much more plentiful red deer, and estimates of numbers are made more difficult because the wapiti do not undertake long migratory walks where they can be counted.

In the various valleys they have infested they have merely to walk up to the tops of the local ranges in summer, and to the bottom of the valley, 1000 to 1200 m below, in winter. They do not have a regular migratory route in New Zealand; they just trample the hillsides at innumerable spots—up and down—browsing the succulents and grasses to ground level.

History

These wapiti are descendants of 18 animals presented to the New Zealand Government by President Theodore Roosevelt on behalf of the United States Government in 1905. They were liberated by an unthinking Government at the head of George Sound, 50 km south of Milford Sound.

The wapiti were first hunted in 1923, by which time they were well established. Since then trophy hunting and general stalking have given recreation in the splendid and almost inaccessible area cutting right across the centre of Fiordland National Park.

In 1909 moose were liberated in Dusky Sound, but they seem to have disappeared, the climate not being to their liking. This has left the wapiti as the largest introduced animal inhabiting our forests in the wild. The area from George Sound to Lake Te Anau and up to Sutherland Sound—about one-fifth of Fiordland National Park—is now inhabited by the wapiti or the red deer-wapiti

hybrids and bears the imprint of these large animals.

Effect of hunting

Until the advent of the helicopter the pressure of hunting was the sole method of controlling these noxious animals, and it is still fortunate that hunting pressure is maintained and the animals are kept in check, but it is not sufficient to halt the expansion of the herd. Though successful control has been achieved in selected areas, the pressure of hunting has been found to be entirely inadequate to cope with the general expansion of herds of red and other deer throughout New Zealand forests, and certainly of wapiti and red deer observed in Fiordland National Park.

Assessment of damage

Our visit was to examine the effects of deer and wapiti browsing on Fiordland

National Park, and to look specifically at alpine grasses and shrubs and at the effects on soil stability and changes to the forest cover.

We travelled in a passenger cabin-type helicopter, which was immediately sighted by the wapiti as bearing no threat, its appearance and sound being quite different from the hunters' helicopters. So they just stood and looked at us from every vantage point on the Catseye Ridge we landed on. We would have had at least one wonderful trophy and plenty of carcasses if we had had a rifle!

The many points we visited afforded the opportunity of viewing the much-modified forest so typical of all areas in New Zealand where deer are or have been rampant and which is descriptive of much of Fiordland. On the other hand we visited a few mercifully spared examples of



A bull wapiti above Catseye Ridge.



Forest opened out by deer in the Catseye Bay area.

original forest and alpine grassland which the deer could not easily reach.

Nitz Valley

This carved out, glacial valley in the Franklin Mountains has a broad, originally bush-covered floor with a stream running down its centre. It has been the habitat of a wapiti group for many years. The trees have receded to the valley sides, which has left a wide, heavily browsed, open area.

Plants are nibbled to ground level, every blade of grass being square ended and hardly more than 20 mm long. Pathetic coprosmas each consisting of a stick, and some topped with a browsed ball of twigs about 50 mm in diameter, dot the whole landscape.

Deer spoor is everywhere, and a browse line of about 2 m is visible on the forest edge all round the valley through which you look to the bare, black, hollow interior of the forest.

Those wapiti must be in poor condition; they've modified their valley to a point where they'll starve and deplete in numbers.

So what of the indigenous values? Well, they're just holding on in a modified, unpalatable form for the future. Unpalatable pepper trees are invading the area.

Catseye Bay area

Our helicopter disturbed wapiti bulls up high on the ridge sides. They ran effortlessly along and up bare, rocky paths they had formed on the razor-back spurs. They criss-crossed on muddy tracks that traced over the whole slope to the valley floor. Meanwhile the hinds stood peering at us, two ears and a neck over the top of every rise and ridge.

It was unbelievable, because in late January 14 recreational shooters were placed in the area by helicopter and in 6 days managed to shoot only 7 deer. Professional shooters, on the other hand, placed in the

same place shot 10 deer in 1½ days. This is yet another proof that recreational hunters cannot adequately control animal numbers.

When we landed we closely examined the ridges and spurs on foot. Tussock and snow grasses were eaten down to black, leafless balls; even flax leaves were chopped off clean, and unpalatable astelias were eaten. Coprosmas looked like black matted knobs on top of a stick. One could almost see them divaricating to protect themselves, but nearly all were dead. Some even lay on the rock where their roots had lost all binding soil because of erosion.

Barking of standing trees was everywhere. One could thread one's way in any direction and follow a deer track. Each track was indented down about 1 ft and consisted of a series of muddy, pothole steps, particularly on the sides of the ridges; loose rock is exposed and dislodged by the animals' hooves and by water,



Ridge erosion above Catseye Bay.

and so slumping and erosion are starting near the top of the ridges, to the future detriment of the already damaged slopes and forest cover below.

Birch Creek

Birch Creek is high up at the edge of the Midburn in the Stuart Mounts. A long, $\frac{1}{2}$ km by 150 m heavily browsed, cleared patch you

could land a large plane on in an emergency is surrounded by a beech forest with a clean browse line at 2 m, and the polished trunks of the trees show starkly against the interior muddy forest floor, which is devoid of any understorey of ferns and regeneration. The valley is completely eaten out.

Twenty years ago K. Meyer,

of the Forest Service, used to pitch his tent here under a 10-m five-finger in the midst of a thick forest of alpine shrubs, and the whole valley floor was difficult to negotiate, with ferns and regenerating understorey; the valley walls had an understorey of five-fingers of all ages growing, and the canopy was continuous. He knew that the wapiti were already eating their way from the next valley.

Today it is hard to imagine the scene of 20 years ago—echoes of the National Parks Act? What about the preservation of native flora? This priceless area has been ruined. Only the insensitive can visit this and say it is good. That open area will seem to all to have been there for all time. How will people ever dream that as recently as 20 years ago it was covered with healthy forest? This is the clear indictment of the wapiti as a ruinous agent of change.

Yates Point

The coastal strip of Yates Point, between Milford Sound



Forest edge browsed out by red deer at Yates Point.



The dying bush canopy browsed out above Yates Point.

and Martins Bay, and the forest behind it are a wreck. For 30 m in there was no sign of the protective plants which thrive on the forest edge; dead, barked trees dot the coast and the salt-laden winds blow straight into the bare forest interior, creating even more havoc. There is no understorey and the canopy is breaking down.

Here the red deer is the agent of change; after all, the coast here fronts one of the most fruitful areas for deer hunting and recovery—the watershed of the John O’Groats and Kaipō Rivers. So mile upon mile of coastal forest is continuously ruined, and the deer have browsed this shoreline back and forth to extinction. Have this shoreline and forest “been preserved in the national interest”?

Other side of picture

Mercifully, even in the whole area we inspected, there are still a few places where either the deer and wapiti have not been able to reach or where their arrival has been “nipped before they could eat any buds”.

Poison Bay

Poison Bay, 15 km south of Milford Sound, is a beach backed by healthy forest and the whole of it is in an almost natural state; we examined it carefully. This is how Yates Point was before the deer came. The canopy was continuous from the high forest down to ground level on the beach. Succulent plants and mosses abounded; a strong understorey made walking difficult; there were berry plants for the birds to feed on;

broadleaf, five-finger, coprosma, and fuchsia, and ferns such as Prince of Wales and filmy hen and chickens were plentiful. Every now and then one could see a barked tree and browsed leaves, but recently recreational shooters had been here and driven the animals back just in time.

Devil’s Armchair Valley

This is a hanging valley, high above the Milford Track and only 10 km from Milford Sound. Apparently deer and man have found this inaccessible; we were among the very few to visit it.

Here was an alpine grassland valley such as existed throughout Fiordland before the noxious, browsing animals. This is one of the last, unmodified grasslands remaining anywhere in New Zealand. The luxuriant growth of grasses and small berry-

bearing shrubs made the ground spongy to walk on in marked contrast with the rock-hard, browsed grass flats of the Nitz and Birch Creek Valleys.

The whole valley was in ecological balance—birds, insects, perfect trees, mosses, and a tinkling stream winding its way along the valley floor. a rare moment of clarity in what is now another world.

How has all this happened?

The deer and wapiti browse relentlessly on. The Fiordland National Park Board and the Forest Service maintain their

control of deer by helicopter and professional hunting in what is one of the world's largest national parks (14 million hectares). This has been moderately successful, though the helicopters have hunted to where their kills are becoming uneconomic. The deer hide in the valley bottoms, and attempts to find new methods of control are under way.

The National Parks Act is explicit: "... that as far as possible introduced flora and fauna be exterminated". The recreational shooters resist the efforts of the board to operate according to the Act and confront the board with pressure

tactics and public appeals, and so force modification of plans.

They have a strong lobby in Parliament, and in Fiordland and in that other area—the Tararuas—they have managed to have commercial helicopters excluded from blocks of land so that they can enjoy their sport. They attempt to alter the status of these noxious animals to game animals.

A continuous spate of emotional publicity is mounted in the media to gain public support for this minority. They are even pressuring for the very area we visited to be withdrawn from the park as a game reserve—one-fifth of the park—cutting it right in two!

Predictably our visit and my newspaper comment "Horried at the deer damage in the park" brought us immediate and violent abuse in the media. I was accused of "inaccurate and provocative verbal garbage". Personal vilification extended to other members of the party.

We welcome the co-operation of the deerstalkers in ridding the park of these noxious animals. We strongly urge them to get on with the shooting in Fiordland National Park as required under the Act and "as far as possible exterminate introduced fauna" and to use their efforts to discourage those who are obstructing the park boards and Forest Service in their control activities.

The Society will support every endeavour by the park board, the Forest Service, and the water and soil organisations to save Fiordland forests from wapiti and deer.

It is a cornerstone of our policy to protect the forests; these animals must be controlled down to the minimum now if the irrevocable change to Fiordland National Park is to be halted.

Photographs by A. Knowles.

OBITUARY

Dr J. S. Armstrong

DR John Armstrong, physician, scientist, and highly respected citizen of Taupo, died on 6 February. He had been a member and councillor of the Society for many years and latterly was a vice-president.

After settling in Taupo in 1925 Dr Armstrong became a member of the Taupo Roads Board in 1926. Within a year he was appointed chairman and served in that office until 1929, when he did not seek re-election because of the time needed for his work as a physician. Because of his ability and energy, however, at the request of the board he continued to serve, at times as chairman, whenever his professional responsibilities would permit until 1950, when he left to become Medical Officer of Health in Samoa.

Dr Armstrong was a recognised authority as an entomologist and generally on the fauna of the central North Island. When a section of the

Society was formed at Taupo on his return from the Islands it was therefore natural for him to become a member. For several years from the middle 1960s he was a member of the Society's Council.

The Mayor of Taupo, in tribute to Dr Armstrong, said: "He is a sad loss to the Taupo community after a very long course of duty both in community affairs and local government. He has been a wonderful benefactor, unobtrusively, to many local organisations. Always a man of constructive ideas and never negative in his criticism, he was the type of community leader of which we are too short these days."

That is just how we found him as a Councillor. It was always a real pleasure to have him and his wife with us at Society and Council meetings.

All members of the Society will extend to his wife and daughter sincere sympathy in their great loss.

Black robin chick bred on Mangere Island

FOR the first time this century the Chatham Island black robin has bred on Mangere Island. Historically the robin occurred on Mangere Island, but was killed out by collectors, clearing of the bush, and finally by cats before the turn of the century.

THOUGH black robins were known to be still surviving on Little Mangere Island in 1937, the first reliable estimate of their true population was obtained when a Wildlife Service party made a census on Little Mangere Island in 1968. At that time the population was thought to be 18 birds, and concern was expressed at the low number. It was suggested that some birds should be transferred to a more suitable and larger habitat.

In the same year Mangere Island, a recently declared sanctuary, was cleared of sheep. However, its recovery to a bush-clad island was a long way off.

Colour banding

More concentrated research was begun on the black robin and its close relation, the South Island robin, in 1971. Colour banding of the Little Mangere Island robins was necessary to determine survival and productivity and to enable the population to be manipulated by translocation.

This study showed that the population was declining, though at the time it was hoped that this decline was only a temporary setback. It was recognised that after one good breeding season the population could double.

Early in the study it was clear that the habitat on Little Mangere Island was deterior-

**By B. D. Bell,
Wildlife Service,
Department of
Internal Affairs**

ating and that the slow improvement of the habitat on Mangere Island (the only area suitable for immediate translocation of the robins) would have to be accelerated. This work started with the planting of flax windbreaks and akeake (*Olearia traversii*) cuttings. Some 4000 flax bushes and 36 000 cuttings have been planted so far, and a further 25 000 will be planted this year. This planting programme has been generously supported by members of the Society.



Chatham Island black robin after transfer to Mangere Island.

At the end of 1975 it was decided that because the robin population was still declining, at least one pair should be moved to the small but expanding habitat on Mangere Island as soon as the breeding season was over. The population then stood at nine birds, two pairs, three spare males,



Planted akeake now well established behind flax windbreak on Mangere Island.

and two juveniles (one of each sex).

The planned transfer in February last year did not eventuate because of the late breeding season and bad weather. A further attempt in June was thwarted by the weather.

Transfer made

In September a major effort was planned to make the transfer. Unfortunately one of the adult females and the juvenile male had disappeared during the winter, but the juvenile female had survived and was mated to one of the spare males. At first one male was

transferred to make sure that the technique had no pitfalls. Later the two remaining pairs were moved.

All the transferred robins made the trip successfully and established in the new habitat—the bush face on the north-east side of Mangere Island. Two males were left on Little Mangere so that they would not disrupt the mated pairs.

When the Wildlife Service party withdrew at the end of November one pair had nested and there was a chick in the nest. The other pair were courting, but nesting had not begun.

When the party returned in March they found the first

nesting had apparently failed, but the second pair had produced a young bird which had reached independence. Unfortunately the spare male had disappeared.

The new bird has been tentatively sexed as a female. To ensure that it would have a firmly established pair bond by next spring the two males left behind on Little Mangere Island were transferred across to Mangere Island. This means there are now three pairs on Mangere, plus a spare male.

If these can live through the winter and breed next spring, their chance of survival will be enhanced.

Photographs by B. D. Bell.

A summer camp in each Island in January

North Island

THE North Island camp next summer is being organised by the Wairoa Branch and will be held from 28 December to 5 January. The spacious grounds and buildings of the Wairoa racecourse have been booked for the occasion. The racecourse is in the country, but is only 5 minutes' drive from the shopping areas of Wairoa and Frasertown.

Accommodation. Ample caravan and tent sites, as well as a number of buildings to house large or small parties, are available at the racecourse. Caravan points are also available. There is excellent motel and hotel accommodation in Wairoa, but as the camp is being held at holiday time, it would be essential to book early—by June if possible—if this type of accommodation is needed. Members are to make motel and hotel bookings themselves, but details and tariffs are available from

head office or the Wairoa Branch secretary.

Programme. Wairoa is in a very scenic part of New Zealand, and within a 40-mile radius are Lake Waikaremoana, the Mahia Peninsula, Morere Hot Springs, and Te Reinga Falls. All these places are on the programme for visits, and bus transport will be available.

Bookings. A deposit of \$5 is to be forwarded with booking to Mrs N. Bishop, secretary, Wairoa Branch, 25 Crarer Street, Wairoa, Hawke's Bay. The cost of the camp will be kept to a minimum to encourage family groups. The camp last January was booked out and many were unable to attend; so **book early** and be sure of attending the Wairoa camp.

South Island

Southland Branch is running the 1978 South Island summer camp at Borland Lodge, Lake Monowai, from 9 to 13 January.

An interesting programme of educational as well as recreational value is being arranged so that full use can be made of this unique area.

The lodge is maintained by the Southland Youth Adventure Trust and can cater for a group of up to 70 persons. Cabin accommodation is available for 52 people and there are good tent sites in the grounds for those wishing to camp.

For further information and bookings write to: The Organiser, Forest and Bird South Island summer camp, P.O. Box 1155, Invercargill.

Photo competitions

Two photographic competitions will be judged at the summer camps—the Moira Cox memorial colour slide competition and the native bird colour slide competition.

Rules and addresses for entry will be published in the next (August) issue of *Forest and Bird*.

Many wading birds seen at Ahuriri Lagoon

WHEN the tide is high in the channel and the estuary at the Ahuriri Lagoon, the non-tidal marsh outside the stopbank provides patches of hot, dry sand, damp sand flats of salicornia, cotula, plantain, and sea primroses, and seepage pools of warm shallow water. As the tidal water creeps over the mud flats the migratory waders gather.

The godwits—up to 350—arrive in small and large flights from wherever they have been feeding. There is a faint twittering, a few run about, and they settle to rest, either standing on one leg with head under wing or sitting right down with outstretched wing on the hot sand. In a stiff breeze they take up identical positions into the wind—a large patch of shaded grey bodies.

It is worth while disturbing them to see the whole mob rise and circle in formation for a turn or two before resettling. The keen eye of the watcher scans them for something different, a silhouette against the sky.

By Lucy Hodgson

The 50 golden plovers — short billed, smaller, and yellow tinged—sit among them or shelter in the salicornia, where there is just a suggestion of golden heads and solid forms.

Among this thick mob of resting birds on 18 December last year was the distinctive, long decurved bill and darker striped head of the whimbrel. Up to 32 banded dotterels have been seen in summer resting on the hot sand and moving in and out of the salicornia and the larger birds.

At the same time the shallow water has other visitors busily feeding across it and working along the edges. On 14 January 5 turnstones looked coppery as they turned over weed, lumps of mud, and dung; at the same time 8 pied oystercatchers and 3 immature Caspian terns were resting in the heat. The 16 sandpipers seen on 13 December included at least 4 curlew sandpipers, a soft grey with

longer decurved bills and smaller than the mottled sharp-tails feeding with them. A wrybill and stint and 2 black-fronted dotterels added further variety at the water's edge.

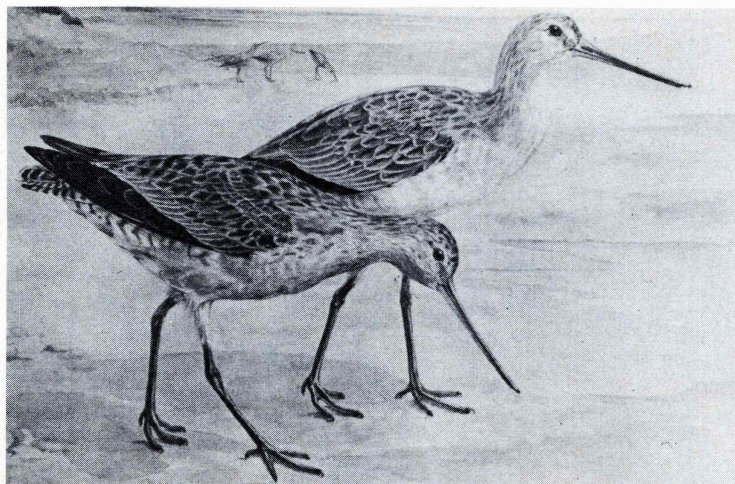
Two glossy ibises showed up among the reeds on 6 February. Their large dark heads and wonderful, long decurved bills were unmistakable. They rose and circled round, giving a large party of the Wellington Branch of the Society there at the time a magnificent view of them in flight. Levin Branch members who visited the area in November were not so fortunate.

On 11 October there was a marvellous trio of large white birds up at the pumping station in the channel. An Australian white ibis was keeping company with a royal spoon-bill and a white heron. Among other special visitors have been 5 white-winged black terns and two little terns, the former with their special hawking flight over water.

The Napier Branch has been taking every action possible to counter the intentions of local authorities to interfere with the Ahuriri wildlife area.

Mr Collingwood's assistance has been considerable, but in January, the appearance and working of a dredge above the Pandora Bridge caused concern. The Napier Harbour Board is pursuing its plans to get great quantities of fill for its reclamation schemes.

However, an ecological survey has now shown that dredging at that point will not adversely affect the wildlife habitat and the effect of the Society's efforts is shown by the clear limitation of the area to be dredged.



From a painting by Lily Daff

Frequent visitors to the Ahuriri Lagoon are the eastern bar-tailed godwits.

Research uncovers more facts about rare native frogs

AFTER the recently successful Maud and Mangere Islands Appeal, most readers will now be familiar with the importance of Maud Island in Pelorus Sound. It is, of course, the island to which the Wildlife Service has recently transferred several kakapo as part of its efforts to save the species from extinction. But Maud Island is also one of only two known localities of one of the world's rarest and most primitive frogs—Hamilton's frog, known to science as *Leiopelma hamiltoni*.

THE other locality is Stephens Island, where the frog was discovered in 1915 by Mr R. G. Smith, though it was named after Mr Harold Hamilton, then of the Dominion Museum, who followed up the initial report (I. G. Crook, I. A. E. Atkinson, and B. D. Bell, *N.Z. Journal of Science*, 1971).

After further forest clearance and disturbance, searches in the late 1940s proved unsuccessful, and the Stephens Island population, confined to a small boulder bank near the summit, was thought possibly extinct. However, about 6 were rediscovered by Dr W. H. Dawbin in 1950, and recent studies by D. Newman and L. Moran of the Wildlife Service show at least 100 frogs are present. The larger population in 14.6 hectares of remnant forest on Maud Island has been known since about 1940 (as discussed by Crook, Atkinson, and Bell, 1971) and was provisionally identified as the same species in 1961 by E. M. Stephenson. This has been confirmed by recent studies, though the Stephens Island frogs tend to be lighter brown than many on Maud Island.

By Ben D. Bell

Retiring habits

Hamilton's frog is one of three native species that survive in New Zealand; the others are Archey's frog, *Leiopelma archeyi*, and Hochstetter's frog, *Leiopelma hochstetteri*. All live in cool, moist forest or ridge-top situations, retiring by day beneath cover such as stones and fallen logs and generally emerging only at night and especially in wet weather.

The native frogs have only limited chirping calls and so are unlikely to be noticed unless specifically sought for. This contrasts with the more familiar introduced frogs that were brought over from Australia last century and now occur in many parts of New Zealand. The brown whistling frog *Litoria ewingi* advertises itself at night by loud cricket-like calls and is known from such areas as coastal Manawatu, the West Coast, and Southland; the larger green frogs that croak loudly from ponds and marshes by day and night are actually represented in New Zealand by two closely related species—*Litoria aurea*, in parts of the north and north-east of the North Island, and *Litoria raniformis*, throughout much of the country.

These three introduced species are readily distinguished from the native frogs in having an external eardrum or tympanum behind the eye,



The habitat of Hamilton's frog on Maud Island—14.6 hectares of remnant forest.



Interior of Maud Island forest, showing rocky forest floor and sloping tree fuchsias, up which frogs may climb on wet nights.



A cool, shaded rocky creek — the habitat of Hochstetter's frog in the Coromandel Range.

horizontal (rather than roundish) pupils, and generally conspicuous colours on the rear thighs (orange-yellow in *ewingi*, turquoise blue in the other species).

Primitive frogs

Though introduced frogs are in a sizeable family of Australasian tree frogs, the small New Zealand genus, *Leiopelma*, forms a distinct and relict group. Its relationship with other living frogs is rather uncertain, though fossil frogs from Argentina dating from the Jurassic period are very close to *Leiopelma* in adult skeletal features, as discussed by J. M. Savage (in the book *Evolutionary Biology of the Anurans*, edited by J. L. Vial, 1973). Among primitive anatomical features of *Leiopelma* are vertebrae that are hollowed at each end (amphicoelous), as in early amphibians,

and "tail-wagging" muscles (though there is no tail during the life of the fully formed frog, only in early development).

With such fascinating creatures as the tuatara and kiwi, the three New Zealand native frogs form part of an archaic fauna that has survived over

DR BELL, author of this article, began his study of New Zealand native frogs in 1972, when he was in the Ecology Division of the Department of Scientific and Industrial Research. He is now a member of the staff of the Department of Zoology, Victoria University of Wellington, and is continuing his research with the support of a university research grant. The study has the approval of the Secretary for Internal Affairs under the provisions of the Wildlife Act.

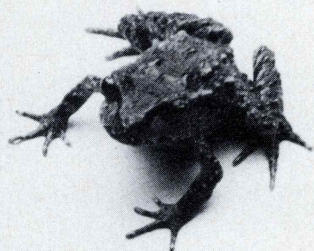
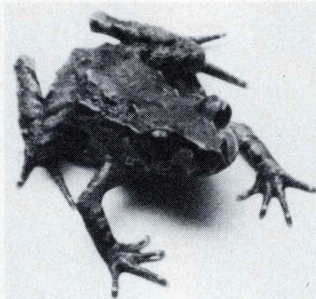
millions of years' isolation in New Zealand. The frogs are listed by the I.U.C.N. (International Union for the Conservation of Nature) in its Red Data Book of rare and endangered species, and at home they are given the full protection of the Wildlife Act 1953, so that it is illegal to disturb or collect them without authority from the Department of Internal Affairs.

Direct development

Unlike introduced frogs, the native species have direct, intracapsular development; that is, there is no free-swimming tadpole, but early development occurs within the confines of the egg capsule. After 6-10 weeks the eggs rupture, and tailed "froglets" emerge; over the following 6-10 weeks the tails are gradually absorbed as the animals develop into small frogs.



A female Hochstetter's frog. It has webbing on the hind feet and is more robust than the other two species.



The adult Archey's frog (right) is very similar in appearance to the immature Hamilton's frog (left). Both are more terrestrial than Hochstetter's frog and lack webbing on the hind feet.

Relatively few eggs are laid, but each contains much yolk to nourish the embryo through its development. Clusters of *archeyi* and *hamiltoni* eggs are laid under stones and logs in moist, cool situations, and those of *hochstetteri* have been found under stones in muddy seepages by creeks. Thus they are able to breed in terrestrial or semi-terrestrial situations, and, as Dr N. G. Stephenson has noted, there are many similarities between the direct development of these frogs and that of some salamanders that breed in similar situations overseas.

Differences between species

Hochstetter's frog is the most widespread, occurring mainly in the vicinity of forested creeks from the Rangitoto Range and East Cape in the south to near Waipu and the Coromandel Range in the north. Archey's frog is restricted to higher altitudes in the Coromandel Range, generally away from creeks, and on Stephens and Maud Islands, where Hamilton's frog occurs, creeks are few or lacking.

Hochstetter's frog is distinct from the other two species; probably because of its creek habitat it is stockier in form and has distinct webbing on

the hind feet. It has now been found that males generally have thicker fore limbs than females, perhaps to help them grasp females during mating in or near moving water. In modern frogs the male embraces the female behind the fore limbs in the pectoral position, but recent studies show that *hochstetteri* (and *archeyi*) embrace in the more primitive, pelvic position, the male gripping around the front of the female's hind legs. *Hochstetteri* reaches 44 mm in length (snout-vent) and most specimens are brown, though some are green.

Archeyi and *hamiltoni* are very similar, being slimmer than *hochstetteri*, without webbing on the hind feet, with distinct glandular ridges (parotoid glands) behind the eyes, and without noticeably thicker fore limbs in males. *Archeyi* is distinctly smaller (usually not exceeding 36 mm snout-vent) and is variously coloured green and brown; *hamiltoni* reaches 48 mm (snout-vent) and is brown.

Except for their colour and sexual maturity, adult *archeyi* are anatomically very similar to immature *hamiltoni*; their size is similar, and their skeletons are more cartilaginous and less ossified than in the larger *hamiltoni* adults (as dis-

cussed by E. M. Stephenson, *Tuatara*, 1961). The two species may represent remnants of a formerly continuous population, for they appear to be very closely related.

Extinction and decline

That native frogs were formerly more widespread is evident from sub-fossil deposits identified by S. Markham from various North Island and northern South Island localities; these include a larger unnamed species (Markham's frog?), now evidently extinct, that reached at least 75 mm (snout-vent), judging by comparison with bones of the other species. Remains of the Polynesian rat or kiore, *Rattus exulans*, have also been found with sub-fossil bones of *Leio-pelma* and give a clue to the possible fate of some mainland populations.

Certainly there is strong circumstantial evidence suggesting that *hamiltoni* has declined under the influence of introduced rodents; it is known only from islands without them. Yet why *archeyi*, which is so similar, and *hochstetteri* have survived with rodents in the north is uncertain and requires further investigation; particular facets of their be-

haviour and habitats may render them less vulnerable. Rodents may reduce available food resources through competition, or may directly prey on the frogs or their younger stages. However, many frogs are made distasteful through glandular skin secretions; to what extent this protects *Leiopelma* species is not known.

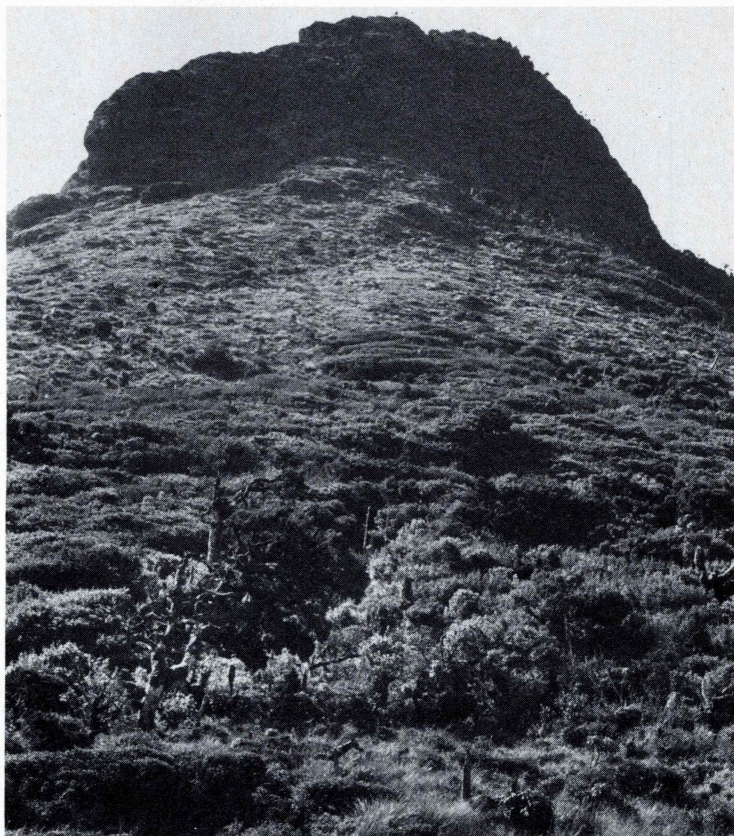
Studies in captivity

Under appropriate Government permits field surveys were begun in early 1972 in habitats of *archeyi* and *hochstetteri* in the Coromandel Peninsula and have since been extended to other areas, including Maud Island.

On the first Coromandel trip *archeyi* and *hochstetteri* were collected and taken to Wellington for studies in captivity. Care had to be taken to keep them cool and moist during the journey south in hot, summer conditions, but all went well and the frogs were soon housed in cool tanks laid out with stones, logs, and mosses to replicate as closely as possible their natural habitats; *hochstetteri* were provided with shallow aerated water, but there was no standing water in the *archeyi* tanks.

The frogs were taken firstly to gain experience in maintaining them in captivity, which was of potential conservation value and paralleled the experience being gained on native birds by the Wildlife Service at Mount Bruce. Secondly, it was hoped to learn more about previously undocumented facets of their life history, such as the mating position already mentioned. To breed the frogs in captivity and then successfully rear their young would be especially valuable.

However, the first hurdle was simply to keep the adults alive and in good condition.



The habitat of Archey's frog near the summit of Mount Moehau in the Coromandel Peninsula.

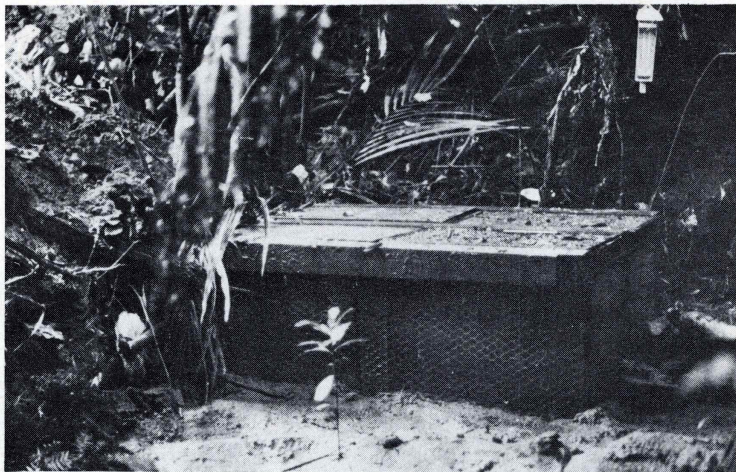
After a sometimes anxious period of experimentation, the larger *hochstetteri* thrived on a basic diet of noctuid moths, supplemented by other insects and invertebrates to provide variety. The smaller *archeyi* took mostly laboratory-bred houseflies, also supplemented with other morsels; many of these frogs still survive after more than 5 years in captivity.

Late in 1972 breeding hopes were raised when *hochstetteri* were seen in mating positions at the water's edge, but unfortunately no egg clusters were laid, even though these could be seen within the bodies of the females. The *archeyi* fared differently; several egg clusters were laid under moss and logs, but all were infertile. This was hardly surprising, since inadvertently all the

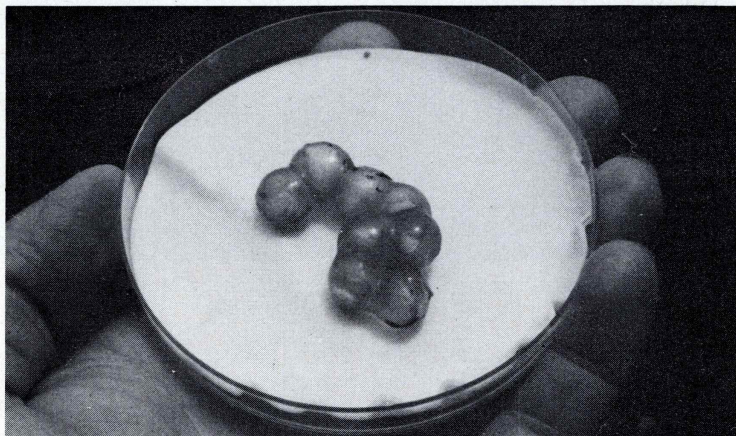
frogs collected were females, which tend to be larger than the males. However, this did not prevent one female from seemingly taking on the male's role and gripping her partner in the pelvic amplexus position at the time of egg laying.

The Wildlife Service arranged to collect some smaller *archeyi* in 1973, some of which we hoped would be males. Fortunately this was so, and the first viable egg clusters laid in captivity appeared in October, and the subsequent development was documented; of 75 eggs laid 35 were fertile. Surviving young were only 8-9 mm long (snout-vent) when they became tiny frogs the following February.

After experience had been gained in keeping the frogs satisfactorily in captivity and



The flood-stricken enclosure housing captive Hamilton's frogs after flood waters subsided on 20 December. The landslip (left) just missed the frogs; the heavy layer of silt (foreground) resulted in deaths of some embryos inside the pen.



The Hamilton's frog embryos were reared on damp filter paper in small dishes in the dark.

thinner and lighter with no ripe eggs evident). Deposited egg clusters of this species have never been found in the field owing to the inaccessibility of likely breeding sites deep within the rock piles where the frogs occur.

Flood rescue

All necessary preparations were made for the captive *hamiltoni* in 1976; not only were they out of doors, but mesh screens were fitted above their pen to replace glass and allow in rain; in addition regular nightly checks of activity were stopped to avoid undue disturbance.

However, this policy of avoiding disturbance was dramatically upset on that memorable morning of 20 December, when record rain-falls occurred in the Wellington region. A visit at 9.30 a.m. showed all was well, despite normally trickling creeks by the frog pens being raging torrents.

Then it happened: A large section of the hillside behind the Hamilton's frog pen roared down into the gully immediately to the lower side of the frogs, fortunately just missing the pen, but causing the already overlaid creek to dam and rapidly overflow its banks. By the time the damage was discovered (about 10 a.m.) the frog pen and an adjacent screen containing meteorological instruments were already all but covered with rising muddy water.

Being unused to water these frogs tire quickly when immersed in it and would have drowned; so, as there was no time to lose, "Operation Rescue", by my wife, Ann, and myself started immediately. It nearly became a human rescue when Ann missed a footbridge and was up to her shoulders in the rising creek.

it had been demonstrated that at least *archeyi* would breed, the stage was now set for attempting this with captive *hamiltoni*. Habitats on Stephens Island and Maud Island were examined and frogs were collected from Maud Island in February 1974 and settled down well in captivity on a basic diet of noctuid moths, like *hochstetteri*.

During 1974 the frogs were indoors, as were the other species, but did not breed. Though a range of sizes was collected, most seemed to be females; so on a further trip to Maud in 1975 a few more

in the likely male size range were collected. The colony was also moved outdoors to a native bush setting, but again no breeding occurred.

Further checks of the population on Maud Island established that they bred in December, seemingly a little later than *archeyi* and *hochstetteri* in the north. Evidence for this was indirect, based on the mean weights and condition of females (before laying, females are gravid with eggs, which may be visible ventrally, but for a period afterwards they are noticeably

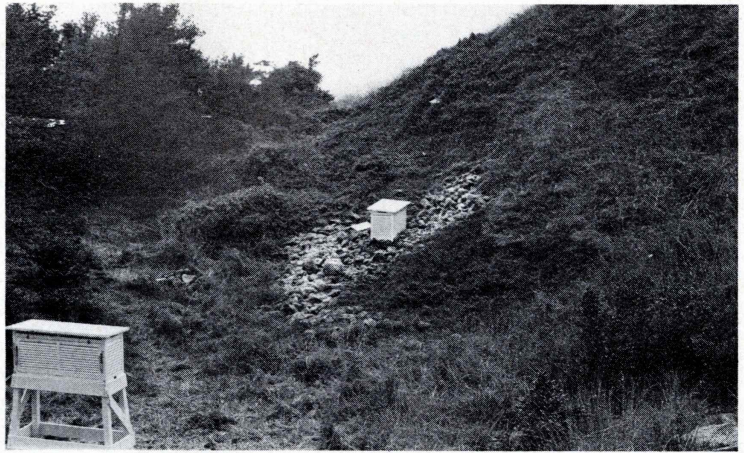
Thus, while residents in the Hutt Valley and Wellington area were desperately battling to save their properties, we were up to our waists in an urgent endeavour to save these rare frogs. By removing all stones and logs we could find in the pen, we eventually plucked out 13 of 14 frogs known to be there into the temporary safety of a plastic bag. That took 15 minutes, and with the rain still torrential and the water level still rising we reluctantly left the last frog and the meteorological equipment, for there was a real danger of further slips.

Soon we had struggled out to drier land and had the 13 lucky frogs temporarily rehoused indoors. Fortunately the *archeyi* and *hochstetteri* pens were elsewhere and were not affected.

Hopes dashed

With such a major disturbance all hopes of *hamiltoni* breeding were dashed: so it was with a feeling of disappointment that the flooded pen was checked for the lost frog later in the day once the dam had burst and the flood subsided. The frog was indeed found, drowned under a stone we had missed earlier. However, this loss was more than offset by the sight of a few yolky frog eggs just visible in the thick layers of silt that had been deposited in the pen — hardly the best circumstances in which to record first the breeding of such a rare species!

Provisional calculations indicated that probably 5 females had laid, during the period from about 30 November to 14 December, with 3 laying about 8-9 December. In all, 30 eggs were found on 20 December and a further 37 the next morning, when the silt was sifted through a sieve; at least 54 eggs were fertile, but unfortunately all embryos found



The exposed habitat of Hamilton's frog near the summit of Stephens Island (1974). *Muehlenbeckia* scrub covers most of the rocky bank (centre and right) and taupata (left) planted by the Wildlife Service provides further shelter. The four meteorological screens monitor weather in exposed and more sheltered parts of the "frog bank".

on the 21st had died, presumably from suffocation under the layer of wet silt.

The surviving eggs were placed on damp filter papers in petri dishes and kept in the cool and dark, and their subsequent development was studied; not surprisingly this resembles that of *archeyi* more closely than that of *hochstetteri*. However, even in early life young *hamiltoni* appear slightly larger than *archeyi*. Most frogs were 11-12 mm long when their tails were finally absorbed by early April.

Further conservation

With some refinements it should be possible to maintain stocks of this rare frog in captivity if their present habitats are threatened. However, at present the wild populations appear in good shape: on Maud Island the population is widely distributed in the main forest area and it may colonise new areas of suitable habitat as they recover under present management.

On Stephens Island the Wildlife Service has planted

taupata, *Coprosma repens*, adjacent to the "frog bank" and has encouraged revegetation of the bare rocky surface with *Muehlenbeckia* and grasses to provide better shelter and greater feeding areas for the frogs; new habitats might be created by suitable management elsewhere on the island, such as by replanting other rock piles with native trees and shrubs or creating rock piles in bush areas now without them.

Indeed it may be possible to extend this policy to a few other rat-free islands in the region, and allow translocation of frogs. Apart from this, further searches could well extend the known ranges of all three species, which may remain undetected unless specially sought for under logs and stones on the forest floor, on misty ridge tops, or alongside forest creeks.

Acknowledgments

I thank many in the Wildlife Service for help in this study, from the initial processing of permits through to field assistance and much discussion, and staff of the Entomology Division, D.S.I.R., who kindly maintained supplies of food for the *archeyi* frogs.

Photographs by Ben D. Bell.

A waggish article in *African Wildlife*, by Robert Cross and Glynne Uys, which explains how a bluffer in Africa can succeed in impressing as a pundit on field days has prompted David Collingwood to show how this advice can be applied in New Zealand. He has modelled the following guide on the *African Wildlife* article and tells newcomers to Forest and Bird trips

How to become an expert on outings without really trying



IF you've decided to be a wildlife expert or naturalist, you must consider the matter of clothing, for if there's one thing that really sorts out the men from the boys it's what they wear.

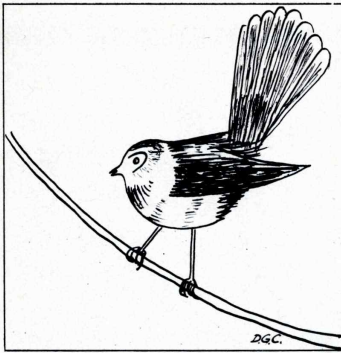
Most important of all is the hat; it must be disreputable and full of character. If such a hat is not part of your wardrobe, buy one, boil it in bleach, then bury it in the garden for a week or two until you've achieved the correct patina of age. Alternatively, you probably have a moth-eaten old

tea cosy of a cap, preferably knitted; this can be adorned with the stray bidibidi or twig trash to be made to look as though it's seen years of tramping service.

The rest of the ensemble should give the impression of having been slept in, or be caked in mud, or have seen good service crawling through a supplejack thicket; it mustn't look new! It especially includes a baggy pair of shorts or even some that show loads of thigh, a faded T shirt, and woollen socks rolled and

wrinkled above the ankle (the men know that that stops them balling up on the toes). Finally, you want a disgusting pair of old boots. For cold weather a torn parka or a very old torn pull-over is acceptable.

For the ladies all the above is perfectly correct, or you may prefer your oldest jeans with the legs torn off, or slacks, any old top, sensible shoes which can be widely interpreted from neat lace-ups to real old botchers, and a hat which may have a pompom or



Passerine.

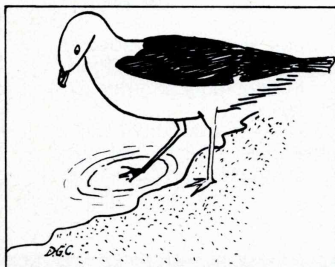
any fetching little number from cloche to a rare old sunshady type.

Now for some help with some of the things you might encounter and hints on how to be erudite and create a suitable expert dominance.

BIRDS

The two approaches most commonly used are, as Lady Bracknell once said, "To know nothing or everything". The first school of thought divides anything that flies into big or little birds, or even "LBJs" which means "little brown jobs"; the second swots everything known about a species so obscure that there's almost no chance of ever seeing it.

If questioned on birds, you can smile sweetly and in a self-deprecating way say, "Actually, that's not my field; I've tended to specialise in the lesser triple-banded shore wader". And **that** stops all further discussion.



Laridae.

BIRD CALLS

The true wildlife expert **never** gets trapped into expressing an opinion on a bird call. As sure as eggs you'll be wrong. I have a treasured memory of once asking four experts what was making a particular noise in a bush; all four gave me a different answer, and out flew a common or garden blackbird. The best strategy is to say you didn't hear it.

PASSERINE

This is an awfully nice sounding word to drop. It means only a bird that perches, and except for the obvious ground walker there aren't all that many that don't.

LARIDAE

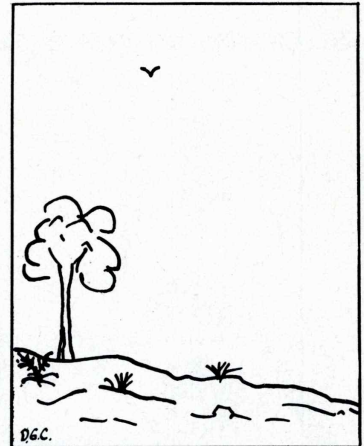
This is another nice word and not very tricky. If the bird looks like a gull and you see it near sea water, you're probably all right. In a bored sort of way just say, "Ah, a member of the Laridae".

BIRDS OF PREY

These are dead easy, particularly in New Zealand. There are only about three of them!

If, during daylight hours you are asked to identify some distant speck, say simply and with great conviction, "Ah, one of the diurnal raptors". Now, it could hardly be anything else, as "raptor" means only a bird of prey, and "diurnal" means it operates in daylight hours, and it's much better than just saying "a common old hawk".

Conversely, if at night something large swoops overhead, you need only vary the formula slightly and say, "Ah, our nocturnal raptor". It's better than saying, "A more-pork". A word of warning: make sure it's not a bat.



Diurnal raptor.

ANNOYANCES

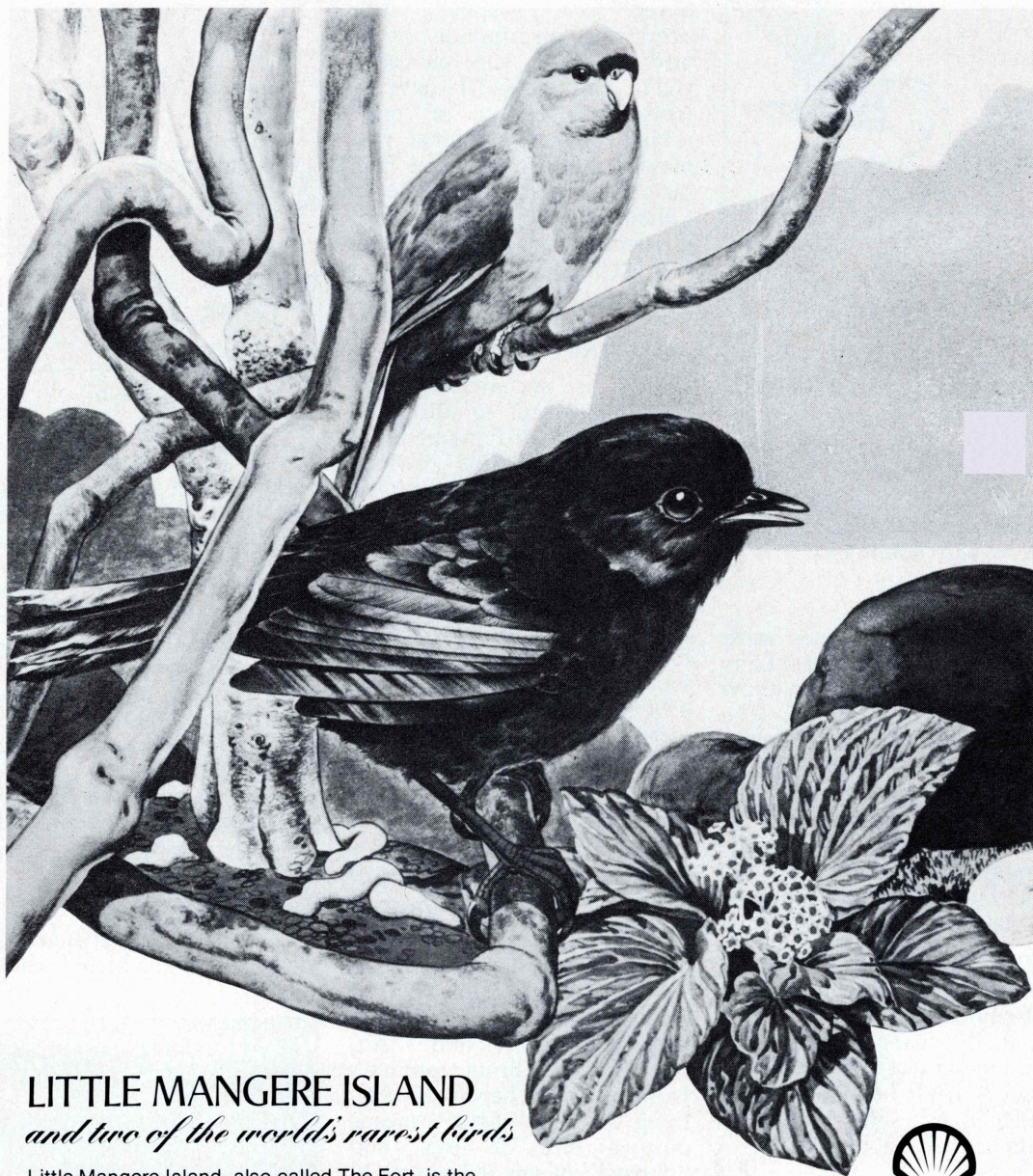
If you can keep your head when everyone is out there slapping and leaping about, you can observe, "There's a heavy infestation of minute dipterous insects round here". When a much more serious attack by buzzing, winged invaders arrives, it's good to say, "The hymenopterous insects are particularly nasty, aren't they?" This catches your companions in their tracks, and they gaze on you with disbelieving respect.

IDENTIFICATION

If you are challenged to identify something small



Nocturnal raptor.



LITTLE MANGERE ISLAND

and two of the world's rarest birds

Little Mangere Island, also called The Fort, is the small steep rock where the Chatham Island Robin (145 mm) is making its last stand.

This rarest of birds numbered only 12 in 1976. Accidental extinction is a risk and conservation is being considered on larger, adjacent Mangere Island.

Little Mangere Island also has the sole breeding population of Forbes Parakeets (280 mm), estimated at just over 20 birds. A large proportion of the Chatham island group's plants and birds has

been found only in the group. Many bird species became extinct following human settlement. Often wildlife survived only on the sanctuary afforded by other islets like Little Mangere.

It is birds such as the Chatham Island Robin and Forbes Parakeet that the Forest and Bird Protection Society are making special efforts to preserve from extinction.





Small scuttler.

scuttling through the undergrowth, demand to know whether it had feathers and was brown. If the answer is "yes", you can state emphatically, "It was a weka". But if your companions say they didn't see, then peevishly point out that they can hardly expect you to identify it for them if they haven't bothered to notice the key identification points. Alternatively you can wonder aloud, "Just who was that Mr Owen who had that small ratite, the little grey kiwi, named after him?"

SPOOR

Here's a real chance to show you're not just an egg-head; anyone can see you have tracked quarry into the dark of the forest by backwoods cunning and that there is a real reason for that well-worn outfit of yours.

So, what to do . . .? Be prepared to kneel down, carefully part the grasses or trash, keep all your companions in a respectful circle, and opine on the depth of the impression and the number of toes and proclaim that it was a "such-and-such" going "that-a-way" and it was here precisely 11 minutes ago! This gives you time to work out whether it really was a Captain Cooker, and if so, you're protected by your companions encircling you. If indeed an ominous grunting can be heard, the expert knows that it's every man for himself and proceeds as fast as he can to the nearest tall tree, which is known as

"education by personal example."

PLANTS AND TREES

Now here's something that's a lot more tricky; after all, they're all green. The thing is to learn a few names and keywords and pass them on with pleasure. If you can remember a few, use scientific words like gymnosperm and you don't have to say whether it's a totara or a rimu, or yet a miro, and it sounds so much better.

In reserves you often find little plaques stuck up on trees; learn a few of these. My favourite is "pukatea"; it sounds so ethnic. On the other hand the "wild Irishman" sounds a bit too ethnic; so call it *Discaria*.

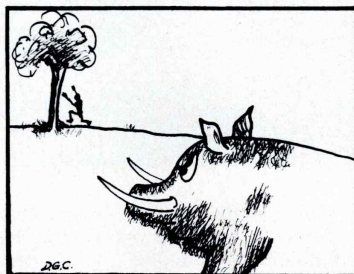
NOMENCLATURE

If you hope to be an expert, a cardinal rule is to use the scientific term wherever and whenever possible. To help you, ferns and fern allies are always pteridophytes; manuka can't be anything else but *Leptospermum scoparium*, and always refer to the tui as *Prosthemadera novaeseelandiae novaeseelandiae*!

Now, if you can find a word that's not even in the dictionary you have a real treasure; my favourite is "retenui testification", which was used by W. H. Guthrie-Smith.

RUBIACEAE

If you see any tree with leaves opposite each other on



Education by personal example.

the branch, you can really have a field day. Firstly, tell them it's a coprosma; you're quite safe, because New Zealand is covered with coprosmas large and small. Then you can idly add, "So all the coffee trees don't grow in Brazil after all"; this will become a matter of wonder and a lasting talking point. Try to find a *Coprosma foetidissima*; you'll become a great guy with the young, who'll discover hours of happiness in future.

OLEARIA

They're everywhere and you're quite safe; and the names are so engaging and well worth memorising. Then you can rattle off, at will, the toothed olearia, the tree-like olearia, the large-toothed olearia, the holly-leaved olearia, the musky olearia, the twiggy olearia, and so on, and when you announce your opinion it's bound to bring a gasp of admiration.

EPIPHYTES

These are much easier than you'd suspect; anything up there that hangs down is most likely an epiphyte, but beware because some of them can be found down on the ground. Even then, you really impress if you say, "Ah, a terrestrial epiphyte".

GEOLOGY

There's only one thing to remember here. "Hmmmm," you mutter, gazing into the distance, "GW"; it stands only for greywacke, and practically the whole country is lousy with it. There's sure to be some somewhere.

So, there you are. You can establish an immediate reputation and ascend the pecking order. If you don't, don't blame me. You're probably using the words without the kind of authority that brooks no questions.

The Otaki—important river for water supply and recreation

THE Otaki River assumed prominence again some 18 months ago after the release of the preliminary impact report on the Horowhenua Electric Power Board's proposal to establish a hydro-electric power scheme in the upper reaches.

By N. E. Dalmer

I said "again" because my recollection of the river goes back to the days of serious flooding of the thirties and forties.

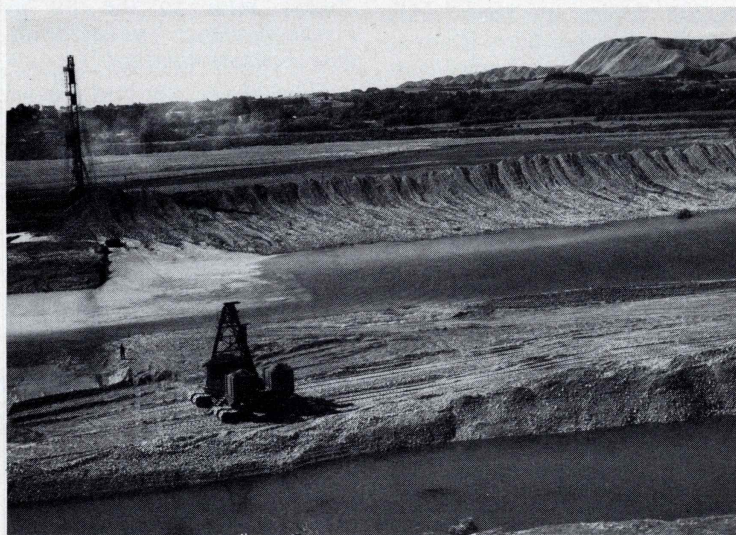
An old resident of the area, Mr V. F. Bertelson, J.P., recalled some of these early inundations where farm lands, particularly in the area now occupied by Otaki College, were flooded and crops wiped out from time to time. In one flood he mentioned the grandstand at the racecourse was affected and the dairy factory up stream of the railway was flooded. The large culverts under the railway embankment designed to relieve the ponded flood waters from these floods still remain.

The largest flood recorded by the Manawatu Catchment Board (90 000 cusecs) occurred in 1955 shortly before the completion of the new road bridge and took away all scaffolding below deck level.

Flood control

The Otaki River Board made valiant efforts to control flooding in the lower reaches, but the build-up of shingle was too great for the equipment then available. It was not until a massive dragline excavator was obtained by the former Public Works Department in 1946 that real progress was made.

Some excerpts from the *Public Works Statements* make



National Publicity Studios photos

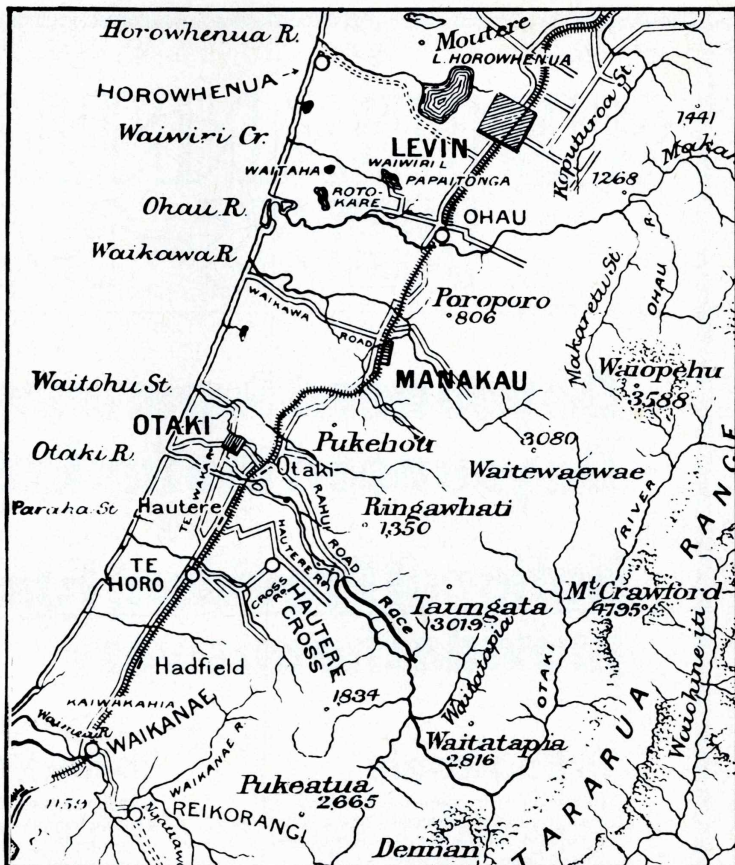
Two views of the Otaki River photographed in 1950 after a massive dragline excavator had been installed to control the build-up of shingle. The illustration at top shows the stretch of the river from the railway bridge to the mouth. That at bottom shows the banks of shingle piled up by the excavator.

1947. The first big dragline excavator was assembled at Otaki River during the year and has commenced straight-lining and stopbanking. Experience on an accessible job such as this was necessary to gain full information before using the machine on large jobs.

1947. Otaki River. The major work of excavating a new channel for the river below the railway and highway was commenced early in November, and the tower excavator has removed 121 700 cubic yards of shingle in a length of 25 chains. In addition, the river has been diverted approximately 40 chains above the railway to give a better alignment at the bridges and a large bank containing 5000 cubic yards constructed with shingle and weighted torpedo nets. This will represent a major improvement to the lower river, but at the moment is only in its initial stages.

1948. Otaki River. Excavation of the new channel below the highway bridge was completed in December 1947. Approximately 551 300 cubic yards were removed by tower excavator, making the total for the job 672 000 cubic yards. The length of the new channel is 2 miles 9 chains. The stopbank on the left has been extended almost to the end of the new cut, being 1 mile 70 chains long. The quantity of material in this length is 80 000 cubic yards, of which 60 000 cubic yards were placed during the year under review. Bank protection is going ahead steadily and 2500 ft of rail groynes have been built both above and below the highway bridge. Approximately 10 400 willows and 1300 poplars have been planted on both berms. A start has been made with the permanent fencing, and to date some 40 chains of posts and strainers have been erected, but so far no wire is available.

1949. The excavating of a channel for the Otaki River by a tower excavator was completed during the previous year. This year the plant has been dismantled and 70 chains of stopbank built containing 29 000 cubic yards of material. An 8-chain diversion cut has



The Otaki area, showing the course of the Otaki River. This is a portion of one of the maps which accompanied the 1904 report on the river's suitability for electric power generation.

been made and 2375 lineal feet of rail groynes built. The berms have been planted with willows.

1950. For the first 9 months of the year the Otaki River, from the railway bridge to the sea, was maintained by the Ministry of Works. It was then handed over to the Manawatu Catchment Board.

Even in the early days of settlement in the middle of last century the Otaki River had its place of importance. It made a staging point for coaches and other means of communication from Wellington to the north, there being an old hotel on the south bank of the river with canoe for the crossing when necessary.

Power generation

As far back as 1904 the Otaki River came in for honourable mention as a source of electric power generation. In a report (C.1A), *New Zealand Water-powers, etc.*, presented to both Houses of the General Assembly, P. S. Hay, superintending engineer of the Public Works Department, said:

Otaki; the maximum drainage area of this river available for power purposes is 112 square miles. It drains the western slopes of Mounts Crawford, Hector, and Alpha, and the flow of water should generally be considerable. The river would probably be best utilised by building a dam in the best site in the canyon about a mile or more below the Waitatapia junction. Some additional

SUPERANNUATION NEWS-1977

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To Employers

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EMPLOYERS are also informed that the National Provident Fund is continuing with the practice, started in 1969, of accepting credits from other superannuation funds for temporary or permanent administration. Such accounts may be held in the name of either the employer or employees.

To the Self-Employed

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height would thus be got; and some storage, sufficient probably to store 2 or 3 weeks' minimum flow, should be obtainable. I think 4000 b.h.p. for continuous working is the limit of the power that could be got from this scheme. The race would be $3\frac{1}{2}$ or 4 miles long and would be on the right bank of the river. The sides of the gorge are rough, and a race would be expensive, and a part of its length would be likely to be in drive. Some approximate sections of the canyon in the gorge were taken and show that the cost for a dam would be relatively high per brake horsepower. Further search might disclose a better dam site. No gaugings of the minimum flow of water in the river have been made.

Another scheme would be to put a power station at the junction of the Waiotauru with the Otaki and bring races to this point to take water from the Otaki and Waiotauru. I have not been able to get sufficient data to formulate a scheme for this alternative. About 80 square miles of the best part of the drainage area would be available for this scheme, water being taken from the Otaki below the Dinnan Creek, and from the Waiotauru at about a corresponding height, or higher if thought best.

Though they do not promise very well, I think these Otaki schemes are worth investigating further to ascertain definitely their worth. A power station on the Otaki would be valuable for various reasons.

The text of this comprehensive report is accompanied by a series of 40 maps, of which plate 15 includes the Otaki drainage area of 112 square miles and it is still looked on as a work of reference even 70 years later.

Shingle

The build-up of shingle referred to earlier in this article has provided the basis for two major and very important industrial requirements—railway ballast for the southern half of the North Island and high-quality concrete aggregate, in total about 190 000 cubic metres yearly over recent years, but in 1975 the total

amount extracted was about 225 000 cubic metres.

The Manawatu Catchment Board, in a report dated August 1976, drew attention to the fact that replacement was insufficient to maintain this usage and it has established restricted areas from which metal extraction is to be prohibited. Meetings are to be held with New Zealand Railways and the Golden Bay Cement Co. to discuss possible alternative sources of supply and finally after 12 months total extraction is to be reduced by at least 50 percent.

Water supply

The water table of the lower Otaki area, an important factor in the maintenance of this Wellington district market garden, is sustained by the Otaki River, and the domestic water supply there also depends on the river.

A rural water supply scheme based on the Otaki River extending to the coast is being investigated by the Horowhenua County Council, and the Kapiti Borough has a long-term interest in the Otaki catchment as a source of urban water supply on the assumption that the Waikanae River will meet requirements for the next 10 years only.

The river, too, has its part to play in irrigation, and a scheme, already approved, to irrigate the Hautere plains area (1600 hectares), south of the Otaki River, is under investigation by the Ministry of Works and Development.

Recreation

However, it is in the recreational field that the Otaki River is best known to the average New Zealander—whitebaiting at the mouth, fishing, a beach resort, and a few miles inland an entry through the gorge to the Tararua State Forest Park.

This park of some 112 000 hectares has long been regarded as the "mountain playground" for the people of Wellington, Wairarapa, and the Manawatu. There is an abundance of wildlife: red deer, goats, pigs, opossums abound; hares, rabbits in pockets, stoats, and weasels are to be found and a wide assortment of birdlife, some 38 species having been recorded in recent years, with a further 13 possible additions. Some of those commonly seen include the fantail, tui, rifleman, native pigeon, kingfisher, shining cuckoo, pied tit, grey warbler, pipit, white-eye, chaffinch, and lesser redpoll.

The last confirmed sighting of the now extinct huia was in the forest park at Mount Holdsworth in 1907.

Beech forest

Then there are the forests, primarily beech. At lower altitudes red beech predominates, with scattered rimu, miro, and kahikatea throughout and localised occurrence of rata, hinau, and tawa. In the wetter west the understorey is denser, with abundant ferns, mosses, and entanglements of supplejack and kiekie. Silver beech is the common timber-line species, though it is replaced by leatherwood on the northern end of the range, where there is more cloud and fog.

This mountain playground is available to all, but must be treated with respect. After all, there are rain, blizzard conditions, rivers, and exposed mountain tops to contend with.

This wonderful natural asset, strategically placed to ensure precipitation of that other natural resource, atmospheric water vapour, must be preserved not only for all to enjoy, but so that its resources are used to best advantage for the betterment of mankind.

To this end a committee is thoroughly investigating the water resource potential of the park and the best use of its very high rainfall. This includes the possibility of tunnelling to enable diversion of the water from one side of the watershed to the other as the need arises for power generation, irrigation, stock, and domestic use—visions of the huge Snowy River scheme in Australia.

Curios under the soil

VEGETABLE caterpillars and the vegetable cicadas are the mummified remains of insect larvae infected with a fungus, *Cordyceps* sp.

The caterpillar of a large forest moth, *Oxycaenus* sp., burrows into the soil to pupate, but it may become infected with the fungus *Cordyceps robertsii*, which spreads rapidly through the caterpillar's body and eventually kills it.

The fungus sends up a spore-bearing stalk and the spores are shed to infect other caterpillars.

Vegetable cicadas are cicada pupae destroyed by a related fungus species, *Cordyceps sinclairii*. They are much softer and less durable than vegetable caterpillars, and the spores are shed from powdery white heads projecting like flowers a few centimetres above the soil.

Vegetable caterpillars are found in bush, especially in patches of well-established manuka. Their brown stalks become easier to find with practice, and careful digging will reveal the mummified caterpillar, which makes an interesting curio.

—Lloyd Esler.

Subscription rates

The Society's subscription rates are:

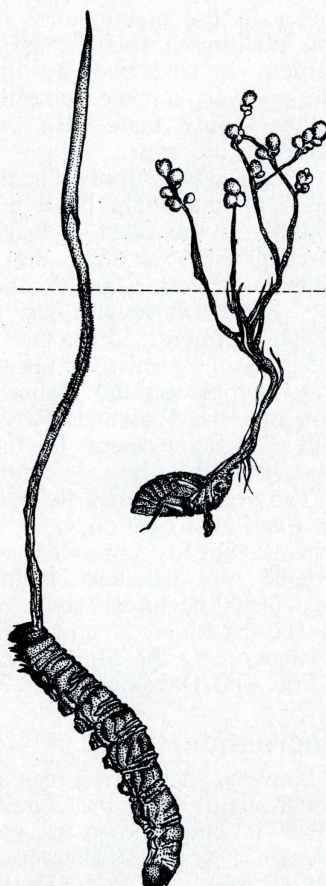
Family, \$7 (husband, wife, and/or children).

Adult, \$5.

Junior, \$2.50 (under 17).

Senior citizen, \$2.50. Life, \$100 (husband and wife).

School group, \$7.



Vegetable caterpillar (left) and vegetable cicada (right). The pecked line indicates ground level.

Annual meeting in June at Auckland

NOTICE is hereby given that the annual general meeting of the Society will be held in the Professional Club, Kitchener Street, Auckland, on Saturday, 18 June 1977, at 9.15 a.m.

Agenda

1. Apologies.
2. Welcome.
3. Obituary.
4. Minutes.
5. Business arising from the minutes.
6. Annual report and statement of accounts.
7. Appointment of Councillors.
8. Remits.
9. Appointment of auditors.
10. General business.
11. Thanks.

Note: The annual report and statement of accounts is enclosed as a supplement to this issue.

Council meeting

A Council meeting will follow at 2 p.m. with the election of: President, deputy president, treasurer, and an Executive of 10.

Sanderson Memorial Lecture

The Sanderson Memorial Lecture will be given at the same venue, starting at 8 p.m. It will be delivered by Mr Arnold Turner, S.M., chairman, No. 1 Town and Country Planning Appeal Board.

This lecture is open to the public; so please bring your friends. Supper will be provided.

Guide to N.Z. birds on special offer

AS a special offer to members the *Identification Guide to New Zealand Birds*, which contains 60 colour plates, is now available to members for only \$2 (including postage).

This easy reference chart, which can be converted to a wall chart if desired, is most helpful, especially to those with a young family.

Apply to your local branch of the Society or to the national secretary, Box 631, Wellington.

Tongariro National Park a good study area for summer campers

MANY miles were walked in both sunshine and rain, up hill and down dale, during the week-long national camp in Tongariro National Park from 1 to 8 January. It was a time for appreciating the excellent amenities national parks provide, the beauty of the scenery, the abundance of interesting plants, and the good company of fellow members.

Trips were made to: Taranaki Falls, Lakes Rotoaira and Rotopounamu, Silica Springs (in the rain), the Tongariro Saddle, Hauhungatahi from Erua, the Blythe Track from the Ohakune side of Mount Ruapehu, and the crater lake on Ruapehu (2530 m). On these trips the campers studied the tremendous wealth of plant life and the varying plant communities.

The party was together for most trips, but there was a dividing up when it came to the Ruapehu crater lake climb; 46 members made a slow trudge up and a fast slide down on the snow—definitely not a botanising or bird-watching walk.

Evening activities of a more serious nature included talks by the Society's national conservation officer and two park rangers. Other evenings were spent in Scottish country dancing and enjoying a light-hearted concert, with talent springing from all sides.

The Moira Cox slide competition was also judged, the winners being Mr N. F. Every, of Te Awamutu, first prize, and Mr C. E. Barwell, of Invercargill, second and third prizes. Afternoon sessions were also held for the many children present at the camp. A short

open-air church service was held on the Sunday morning.

A pair of blue duck was occasionally seen on the Whakapapanui Stream near our lodge, and some members observed riflemen feeding their young in the nest.

The 200 members who attended the camp were accommodated in four lodges and in tents and caravans in the motor camp.

This camp introduced many people to the mountain, and it

is hoped that the enjoyment gained from this experience will encourage more members to stay at the Society's Ruapehu Lodge.

The camp was organised and administered by the Wai-kato Branch and because of the considerable preparation beforehand everything ran smoothly and the camp was enjoyed by all who attended.

—Audrey Eagle.

Photographs by George Brown.



At the church service. The Society's Ruapehu Lodge is in the right background.



Leonie Garvey talking to juniors at the camp.

Conservation report

SINCE my last report in the February issue of *Forest and Bird* the Society's activities have increased, and as a consequence the Society has had increased coverage in the news media. The Society is growing apace, which is causing it increased administration problems. During the period I have spoken to several branches of the Society and to other organisations on our conservation efforts. Some of the more important activities are described below.

I visited the Society's annual camp in January and spoke to the public at the Tongariro National Park headquarters and also to a large gathering of about 200 Society members.

Useful conferences

In February I attended the Environment '77 Conference in Christchurch. This was a most successful conference, well run and most useful as a sounding board for conservation and environmental issues. I think that all who attended went away with the sobering realisation that conservation has become the most pressing problem covering all parts of New Zealand and that stronger actions will be called for if our country is going to retain some semblance of its past balanced ecology.

In early March I took part in the seminar on small hydro-electric schemes in Wellington, at which conservation loomed large for the representatives of local power authorities at the conference. Conservationists from several societies and Government departments gave their views on the need to protect the indigen-

By
David Collingwood,
National
Conservation Officer

ous values in the attempts to expand the energy resources with small hydro schemes.

In the same week I made our Society's submission on the Reserves Bill to the Parliamentary Select Committee, the Society being congratulated on its comprehensive and useful submission.

I visited Fiordland National Park in mid March and examined deer damage, which is reported in the article on page 2.

Tauranga Branch was visited to assist in their proposal to protect the Waimapu Estuary, and in addition arrangements were made for assistance from

the Wildlife Service in mounting a broader-based conservation programme for other parts of the large estuary adjacent to Tauranga.

Towards the end of March the President, Mr A. A. T. Ellis, and I were engaged in Supreme Court hearings in the case of the Society versus the sawmillers at Okarito. The President and I visited the Okarito forest and examined it carefully on Saturday, 26 March, and then attended the hearing in the Supreme Court in Christchurch on 29 and 30 March. Our evidence dealt with our findings on our many visits to the Okarito logging area, and the judge reserved his decision.

Oiled sea birds

The steering committee has met on two more occasions and is fast progressing the



An oiled sea bird. The feathers are glued together and the bird is helpless.

equipment needs and programme for the training course—which has had to be set down for a later date, in June at the earliest. Decisions on methods pertinent to the New Zealand sea bird population have to be carefully formulated.

The response from branches has been most heartening, and the news media have been extremely interested and have published material about the oiled sea bird warden system.

A long audio-visual instruction pack has been bought from the International Bird Rescue Research Centre in California, and this is now being modified to suit conditions here and will be used at the training and subsequent courses.

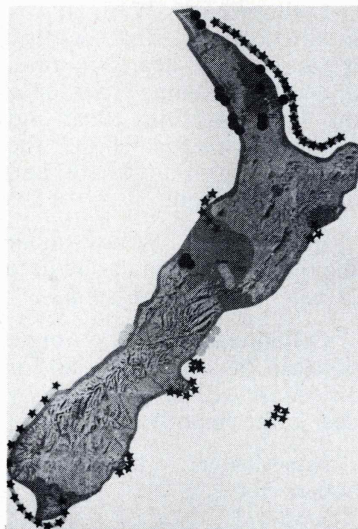
Use of 1080

At a public meeting on the use of 1080 poison in the Wairarapa I protested strongly for the Society on the use of raspberry jam lures and grain baits. The Forest Service and the Agricultural Pests Destruction Council gave assurances that these practices would cease in any poisonings with 1080 undertaken by them.

Later I made a broadcast on the national radio "Green Belt" programme, at 1.00 p.m. on Sunday, 27 March, which made our policy plain to all. I pointed out that though this was the present stand of the Society, we were constantly on the alert for any information which might indicate that dangers unknown now might be involved in the use of 1080, or for more effective and safer methods of dealing with the noxious animals' threat to our bush and birds.

A transcript of the broadcast follows:

Interviewer: The best method of eradicating opos-



The most vulnerable points on the New Zealand coast for bird rescue in the event of oil spillage.

sums appears to be 1080, but carelessly used 1080 kills a lot of other things besides opossums. In fact, there is a full-scale battle being waged by some people to have it banned; though some think so merely because it has been banned in America.

Most of the protesters are afraid for our native birdlife. So I went to see David Collingwood of the Forest and Bird Protection Society, expecting him to be a violent hater of 1080, but people don't always react the way you expect them to.

Collingwood: We consider that of all poisons used such as strychnine and phosphorus (and gin traps where mechanical trapping is concerned) 1080, when handled correctly, is possibly the most humane killer.

Interviewer: What about its effect on birdlife?

Collingwood: We have been studying this for years, certainly since 1080 was first used; we have been party to tests and have carried out tests

ourselves on the preference or otherwise of birds for types of baits which contained 1080. The interesting thing we have discovered is that if carrot baits are used, and those are carefully screened and coloured green, birdlife is hardly affected at all.

However, trappers and people who intend to use grain baits or jam lures cause great decimation of our birdlife. For that reason we are strongly against the use of any jam baits, grain baits, or any fragmented carrot. We think that it must be carrot in large chunks—about 1 in. in diameter—and coloured green, and we then feel that our birdlife is comparatively safe.

Of course, there are some birds which are raptors, that is, birds who are carrion eaters. You can think of them as hawks or keas. If they return to a body of an animal which has died through 1080, they could eat sufficient to kill themselves. So there is a risk in that respect, but with our normal native birds there is no risk at all if the correct bait is used.

Interviewer: I believe that new work has come to light which says that 1080 is a cumulative poison to some extent. Do you know if this happens with birds?

Collingwood: We question this. Our evidence shows that 1080 is not cumulative, and, in fact, we come out quite strongly on this in any submissions we make.

Interviewer: Do you have any worries about 1080 getting into streams and water supplies as far as fish life is concerned?

Collingwood: None whatsoever; 1080 is a colourless powder, and it is odourless. If it is mixed with water in very concentrated proportions,

yes, of course, it would be a killer; it is a poison, after all. It is a fact that at the concentrations leached out in water a man would have to drink at one fell swoop about 1500 gallons of water before he would start to feel any effects.

Interviewer: And fish are apparently even more resistant to this poison than man?

Collingwood: I think this is true; again, it's always because when the 1080 is in the water, it is not a thing which will stay at its strength. It is dissipated, and eventually it is biodegradable anyway, so that fish are the least likely to be affected.

Interviewer: Well then, as far as birdlife is concerned, what is the prime thing that must be watched by operators who are using 1080 carrot baits?

Collingwood: They must watch to see that it is coloured the appropriate colour of green; they must watch to see that there are no fragments of carrot which birds could presumably pick up as small "tit-bits"; the carrot should be in discs of at least 1 in. in diameter. Under these conditions 1080 is fairly safe to all birdlife.

Interviewer: What about the effect of 1080 on other animals?

Collingwood: Well, it varies. Dogs in particular are very subject to 1080, and dogs of course get a tremendous nervous storm as a consequence. They seem to go into a fit—it is horrible to see—and, of course, it is painless for them; it is the same as an epileptic fit. Nevertheless, it is very dangerous for you to leave dogs running around at that point.

Interviewer: Now, what about the effect on deer, for instance?

Collingwood: Well, it's a totally different effect, because it causes their hearts to race. A deer just slumps down once the 1080 takes its effect and sits in that place; it hasn't the strength to run anywhere, and it just dies there.

Interviewer: What about the question of uptake by deer of baits left for opossums?

Collingwood: That's quite possible, because baits laid for opossums will be taken up by deer quite happily.

Interviewer: Does this bother you?

Collingwood: Not at all. I think that deer are noxious animals, just as much as opossums are, and I think that certainly a reduction in the number of deer will be a good thing for the forest and for our birdlife.

I have just been down in Fiordland and I have been examining areas of forest where deer have not arrived and they are full of birdlife. I have found other areas of forest where deer have eaten out the whole lot, browsed everything, taken all the berry fruits, all the food from the ground underneath, and turned the whole place into a great cow pasture. Though the areas were geographically similar, the browsed areas had few birds in them, whereas the others had plenty.

Interviewer: In summing up then, how do you regard the use of 1080 in the forest?

Collingwood: I think it is a benign thing. I feel that it will attack all the introduced noxious animals—deer, pigs, goats, opossums, and stoats—all of which are threats to the forest botanically and to birdlife. With the use of 1080 in our forests there is a future for them. I feel that we may return to something like the type of

forest that existed in our country before these noxious animals were there; it can only be a good thing.

Interviewer: Mr Collingwood stated that it is possible for keas and other carrion-eating birds to eat large quantities of flesh from an animal that has been killed by 1080; that is why it is banned in America. Their bald eagle, which is a national symbol, is an endangered species; that means it is threatened with extinction because of the low numbers left, and it lives exclusively on carrion flesh; so why wouldn't you protect your national symbol?

But our carrion-eating kea is far from endangered, and it lives on a mixed diet, anyway. Obviously, 1080 can and does kill birds if it is carelessly handled, but if the precautions for its use which Mr Collingwood mentions—green dye and only large-size carrot baits—are rigidly adhered to, there is virtually no problem.

Green dye is always used nowadays, but making sure that the baits used are only large ones is what is still giving some problems. However, a lot of time and money is being spent trying to solve that one by the people most involved—pest destruction authorities and the Forest Service.

In America the bald eagle is now safe from 1080, but since there is no other effective control method for coyotes, these are now increasing so rapidly that some farmers are having to give up running sheep. That same thing would not happen here, but we might find that we cannot run cattle anywhere near opossum country if we cannot use the only practical control there is—1080.

Raising native seedlings contained in forest duff

ALL native-plant enthusiasts will appreciate the difficulties in collecting and establishing a representative range of the species growing in local forests and shrub lands. Numbers of transplanted seedlings die because they are too soft to transfer into garden situations, and many forest species are not widely represented as seedlings of a size suitable for transplanting.

Furthermore, the irregularity of seed crops, the location of reliable seed trees, knowing when seed is ripe, and (when seed is collected) providing suitable conditions for germination make raising native species from seed very much a hit-and-miss affair for all but the dedicated.

Reservoir of seed

As an alternative to collecting seed as it falls, there is the possibility of tapping the reservoir of seed lying on the forest floor after most species have ceased seeding for the year, by collecting forest duff and germinating the seed contained in this duff in prepared beds. In addition the seed of some, probably many, species remains viable for more than 1 year, and a species not seeding in a particular year may well be present as ungerminated seed lying on the forest floor.

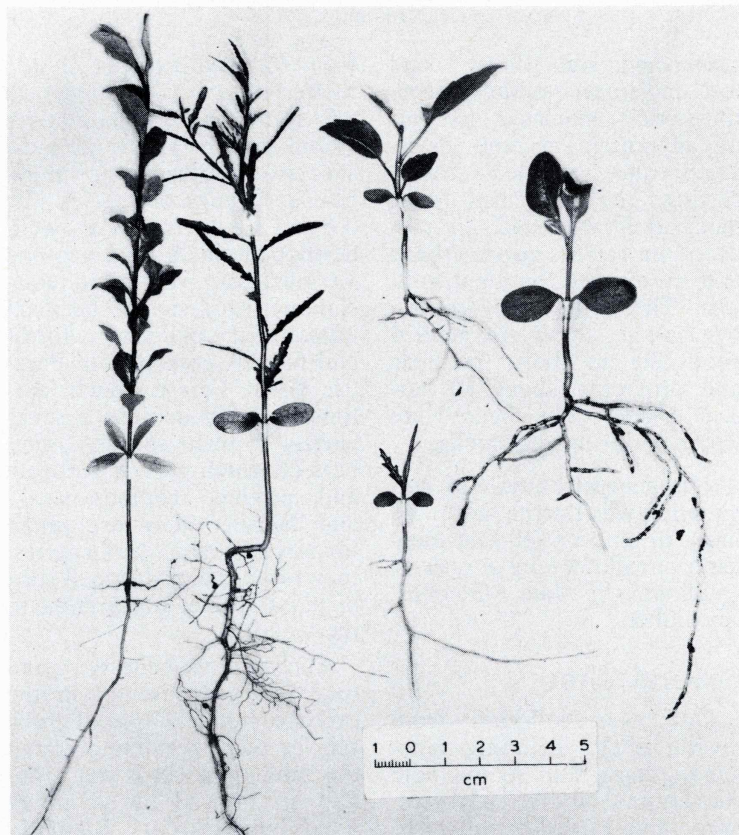
Obviously, species growing closest to the collecting site will provide the bulk of seed, but in New Zealand many shrub and tree species rely heavily on birds for seed distribution. Some species not represented in the immediate vicinity will therefore appear as seedlings elsewhere through being transferred from their source by fruit-eating birds such as tui, bellbird, pigeon, silvereye, blackbird, and starling.

In 1975 we carried out a trial in the Forest Research Institute nursery, using duff collected from under various forest and shrub communities in the central North Island. Duff was raked from the forest floor, care being taken that by hard raking the underlying moist, fragmented, humi-

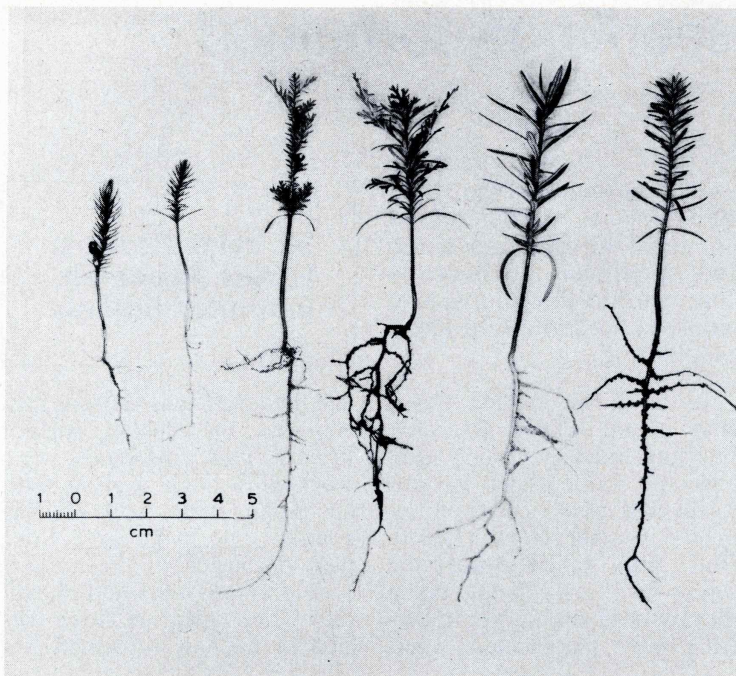
fied material was collected as well as the coarse surface litter. This material was worked through a sieve with an 8-mm mesh and all the coarse, dry twigs and litter were discarded.

A previous trial had shown that when unsieved litter was laid in beds it remained un-

**By John Herbert,
Forest Research
Institute, Rotorua**



Seedlings left to right: *Pittosporum colensoi*, pokaka, five-finger (upper), lancewood (lower), and broadleaf.



Seedlings left to right: Rimu (2), kahikatea, tanekaha, totara, and matai.

compacted and "fluffy" and lost moisture rapidly. Seedlings that managed to germinate often become desiccated and perished. After sieving, the remaining dark moist duff was laid 20 mm deep on raised nursery beds and compacted by light rolling. The beds were covered by saron mesh suspended about 20 cm above the beds and providing about 50 percent shade. The beds were watered during dry spells.

The general pattern of germination was for the first seedlings to appear in late September, followed by a rush of seedlings in late October–November.

Several sites

Duff was collected from several sites, including tanekaha, totara, and toatoa pole stands and under kahikatea, miro, and *Pittosporum colensoi* trees. Seedlings were obtained in densities ranging

from 52 seedlings per square metre (totara pole stand) to 950 seedlings per square metre (kahikatea tree), but the most successful collection for numbers and range of species was obtained from a well-developed shrub land ecotone (a particular vegetation association) sandwiched between unmodified podocarp forest and tussock grassland in Pureora State Forest. Such ecotones usually contain a great variety of plant species (numbers of which grow vigorously and produce copious seed) and because they are much favoured by many bird species, they receive bird-dropped seed of plant species not present in the vicinity.

Fuchsia, wineberry, and tutu were not present in the ecotone, but seedlings of these species were germinated from the duff. The seed was probably introduced by silvereyes and blackbirds. Similarly hinau, *Coprosma colensoi*, *C. robusta*, *C. lucida*, *Melicytus*

ramiflorus, *M. lanceolatus*, *Cyathodes fasciculata*, and *Pennantia corymbosa* were not growing on the collection sites and were probably introduced as seed by tits, grey warblers, tuis, bellbirds, and pigeons. The composition of the ecotone itself undoubtedly reflects the longer-term seed-dispersing capabilities of an even larger variety of bird species.

In this particular collection 47 indigenous shrub and tree species were germinated from less than half a cubic metre of duff. Seedling density was 950 seedlings per square metre with duff laid 20 mm deep; this quantity of duff provided more than 20 000 individual seedlings in the first year. Lancewood (60 percent) and a variety of *Coprosma* species (25 percent) made up the bulk of the seedlings, but tree species included broadleaf, kahikatea, kamahi, maire, matai, pokaka, putaputaweta, rimu, tanekaha, and totara; small tree or shrub species included five-finger, *Gaultheria* and *Hebe* species, *Melicope simplex*, manuka, *Neomyrtus pedunculata*, *Pittosporum colensoi*, *Pseudopanax anomalus*, and toro. Much seed failed to germinate in 1975, but seed of a number of species is now germinating in the second year in the beds.

Depth of beds

Duff from the same collection was also laid 40 mm and 10 mm deep on the beds. The 40-mm deep bed produced 1250 seedlings per square metre and the 10-mm deep bed 410 seedlings per square metre. However, most seedlings in the 10-mm deep bed were less vigorous than in the 20- and 40-mm deep beds, and the duff dried out badly in summer. The 20-mm deep beds gave the best results in terms of vigour, survival, and

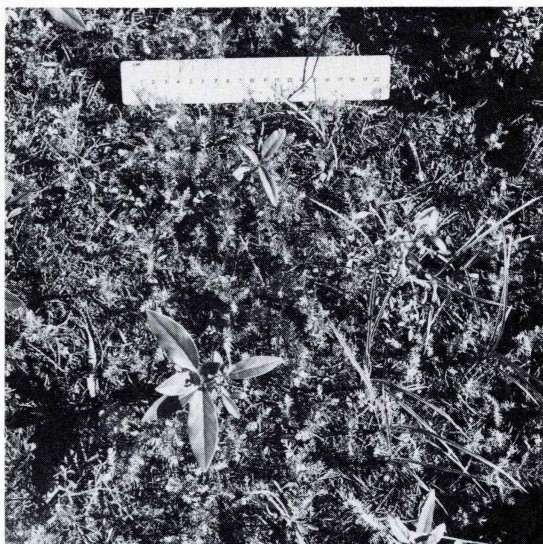


Above: Seedlings germinated from duff collected in shrub land ecotone in autumn; duff laid 20 mm deep; density about 900 seedlings per square metre. There is a tangled mass of lancewood and small-leaved *Coprosma* seedlings. Also visible are large-leaved *Coprosma* spp., wineberry, and *Hebe* sp.



Above right: Seedlings germinated from duff collected the same as for the bed at left, but laid 40 mm deep.

Right: *En masse* germination of kahikatea seedlings from duff collected in spring from under a kahikatea tree; density about 820 seedlings per square metre. In all three illustrations the white rule is a little over 20 cm long.



number of seedlings per unit volume of duff.

Forest and shrub ecosystems provide shelter and food for a myriad invertebrate fauna and for birds, rats, and mice. During summer and autumn an abundance of food is available, but in winter and early spring some of the forest fauna must rely heavily on ungerminated seed lying on the forest floor. Duff was collected from adjacent and identical sites in May and October.

The May collection pro-

duced 950 seedlings per square metre, the October collection only 100 seedlings per square metre in the beds plus 250 seedlings per square metre that had germinated *in situ* in the May-October period. Most of the difference of 600 seedlings per square metre is accounted for by reduced numbers of lancewood and *Coprosma* seedlings from the October collection. The hard-coated *Coprosma* seeds were almost certainly destroyed by insects or rodents over winter,

but there is the possibility that the less robust lancewood seeds failed to overwinter.

Some indirect evidence indicating that quantities of viable lancewood and *Coprosma* seed are destroyed is provided by comparing the total *in situ* seedlings with seedlings resulting from the May collection. By February 1976 a total of 258 seedlings per square metre had germinated in undisturbed *in situ* beds, compared with 950 per square metre in the

nursery beds from the May collection.

Again, it is possible that because of different light and moisture conditions in the ecotone many seeds failed to germinate, but the fact that some seeds of both species did germinate *in situ* (41 lancewood and 100 *Coprosma* species per square metre) indicates that at least part of the difference in seedling density between the May and October collections is due to seed destruction by insects and rodents.

Important points

For people wishing to raise native seedlings in this manner the following points are important:

- Select a site with an abundance of vigorously growing species, preferably a shrub ecotone along the edge of high forest.
 - The collecting site must be raked hard to collect the dark humified material lying under the surface litter. This material provides a good seedbed and contains much of the seed.
 - The material must be sieved to remove the coarse surface litter. Two layers of chicken netting would be suitable for all except large-seeded species such as miro.
 - The duff bed requires shade and must not dry out. Saron mesh provides good shade, but any moist, shady situation free of weeds would be suitable.
 - It is probably best to collect the duff in autumn, after most species have ceased seeding, and to sow immediately on to the prepared bed.
 - Depending on species, seedlings will be between 10 and 40 cm high at the end of the first summer.
- Forest Service photos.

Target reached

THE Fitzgerald Glade Appeal fund has now passed \$3,000, the sum which the Waikato Branch had promised the Department of Lands and Survey that it would raise. The amount is the purchase cost of the extension to the existing reserve.

This proves that conservation is not just words and that people are willing to support financially what they believe in.

Bush-saving efforts like this make one proud to be a member of the Society.

To all who contributed: thank you.

—Audrey Eagle,
Chairman,
Waikato Branch.

Competition for photos of native birds

AT the 1977 national summer camp it was proposed by Noel Sargisson, of the Waikato Branch, that a competition specifically for photographic slides of native birds should be established. As photographing birds required so much skill and patience, it was thought that this type of slide was at a disadvantage in the Moira Cox competition.

The competition was to be run on similar lines to the Moira Cox competition and at the same time.

Copies of the winning slides could be retained by the Society as a record of New Zealand native birds.

This project has been approved by the Executive, and a fund is to be established for which donations will be gratefully received by the national secretary.

Support Conservation Week

THE dates for 1977 Conservation Week are 29 July to 7 August, and branches need the enthusiastic support of all members in the running of the special projects and activities.

During this week all conservation bodies join forces to draw the attention of the public to the vital need to conserve the country's natural resources and flora and fauna.

Spare a few hours during this important period to show your practical support and help make the effort successful.

Refrigerator wanted at Ruapehu Lodge

A SECOND refrigerator is needed at Ruapehu Lodge, preferably a 6-7 cu ft size.

Any good second-hand appliance that can be donated will be acceptable, though a donor fairly near the lodge would be preferable because of transport costs. It would be even better if the refrigerator could be delivered there by the owner.

Please ring or write to the national secretary, Box 631, Wellington, if you can help.

New forest park

THE Queen, during her visit, signed a proclamation setting aside a new State forest park in Nelson and Marlborough.

The Minister of Forests (Mr V. S. Young) said the park would consist of 434 290 acres of State forest land and some former Crown blocks.

The new park came into existence on 4 March and has been named Mount Richmond State Forest Park.

BOOKS

Shell Guides to the Great New Zealand Walking Tracks: P. Temple

BY creating a wider awareness of New Zealand's natural environment Philip Temple, in this series, is doing a real service to our own people and particularly to young people.

Each booklet, with distinctive colour cover, is profusely illustrated in monochrome, gives a brief history of the track, a centre double-page map and route guide, and general information about access, accommodation, weather, season, clothing, and equipment; fitness preparation and approach to walking are also dealt with.

Milford Track. In the text amplifying the route map and walking times Mr Temple recalls

in detail those experiences so enjoyed by me when walking the track several years ago. His description of points of outstanding interest and beauty—the drooping moss on the low trees, the birds, and natural features—are true to life and experience.

Routeburn Track. The description of this track also brings back memories to me and fills in those gaps not experienced: it was my son who walked this track immediately after our trip over the Milford Track and on meeting a friend on the wharf at Queenstown did it again—twice in one week!—to give that deep satisfaction and enjoyment to another.

Heaphy Track. I have always wanted to walk the Heaphy Track and though I have not had that physical satisfaction, a perusal of the guide has confirmed and added to my understanding and pleasure of the territory traversed by other members of my family.

Tongariro Track. This walk is vastly different from the Milford, Routeburn, and Heaphy Tracks in that it skirts two active volcanoes, and sections of the track skirt their debris. In other sections there is heavy bush with its varied bird life, but this is alpine landscape.

These tracks are our heritage, for us to enjoy, and I thank Philip Temple for highlighting their beauty and value as they are.

—Norman Dalmer.

Whitcoulls, \$2.00.

Rei Hamon, Artist of the New Zealand Bush, Second Collection: R. Hamon

ONCE again a book of Rei Hamon's unique drawings has been published. His great love for the forest becomes increasingly apparent the longer one spends looking at his pictures, and it is realised that it is only through a humble approach to his subject that so much patience and devotion can be exercised.

Though the drawings are reduced to fit a page 37 cm x 25 cm, in this space the artist has created

the feeling of a vast forest. This feeling is even more impressive when one compares, on adjacent pages, the full-sized details of some of the larger works, as these small portions of the whole are complete and beautiful pictures in themselves.

There is sufficient variety in the subjects and in their treatment to retain interest throughout the book, the brief descriptions bringing out the artist's personality and making him a real person.

Rocks, driftwood, and living plants are all depicted in great detail and beauty of line, the tree ferns being particularly sensitively drawn.

The only holes I can pick in the book are in the kawakawa on the page of leaf drawings. These I feel should be white and not black.

This book is of the high standard one would expect from Collins, the publishers, and they, together with the artist, have produced a volume worthy of the New Zealand bush, this heritage that Rei Hamon is using his talents to help to save.

—Audrey Eagle.

Collins, \$15.

Birds and Birdsongs of New Zealand: Gordon R. Williams

THE three booklets accompanying the birdsong records and cassettes produced under the Kiwi label have been combined into this book of 109 pages.

The author is a well-known ornithologist whose text can be

relied on for scientific accuracy without dry or uninteresting reading. Fifty species of birds are each described in one page of text accompanied by a full-page black-and-white photograph. The title is rather misleading, because there is

no specific attention to birdsongs other than one sentence at the end of each article.

This book takes its place with several of the same type which are now available; all of them are useful to the general reader.

B. A. Ellis.

Reed, \$2.50.

BOOKS

The Mother Earth Manual of Organic Gardening: John Bond (Ed.)

FACED with rapidly rising prices, many people are finding satisfaction in growing their own vegetables.

The Mother Earth Manual of Organic Gardening will do much to enlighten its readers. For the complete novice, as for the experienced gardener, it will provide a wide range of information.

Amateur growers from Britain, Australia, North America, and New Zealand submitted many gardening experiences, and these

findings were reinforced by a team of 80 researchers.

Of particular interest are sections on companion planting and beneficial and antagonistic plants. A comprehensive section on gardening planning will prove of great help to all keen vegetable growers.

As can be expected in such a book, composting and mulching receive thorough attention. Various methods of constructing compost bins are discussed, and the explanation in this chapter will be encouraging to those who have not

yet introduced composting into their gardens.

As the harmful effects of chemical sprays become more widely recognised people are acknowledging the need to find alternatives. Listed are plants which have beneficial effects on their neighbours. I am sure many people will find this section useful.

This book will satisfy a deep need in our communities as people search for alternatives to the artificial, chemically controlled garden. *The Mother Earth Manual of Organic Gardening* will be an outstanding contributor in this field.

—M. Fisher.

Reed, \$4.95.

Parsons' Glory: John Parsons

SUBTITLED "Trout fishing in New Zealand—a bedside book for anglers", this is not a manual on trout fishing, but rather a collec-

tion of reminiscences. The author deals with a range of angling trips and methods of fishing, comments on fly-tying, and recalls other anglers and books on angling.

Of particular interest to readers of *Forest and Bird* will be the author's observations on the weather, birds, and insects (particularly as trout food).

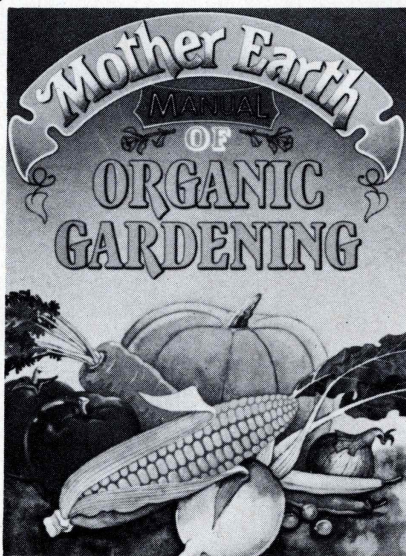
The book is illustrated with excellent colour plates on fish and fishing scenes.

—R. S. Slack.

Collins, \$8.50.

10% Off

**Special
Offer to
members**



In a world which is increasingly controlled by push-button sprays and chemical deterrents more and more people are turning to growing their own food naturally, without the aid of artificial fertilisers and poisons. This book is a basic primer in organic gardening, the growing of wholesome food without threatening the environment in the process.

The most striking feature of this book is its wide-ranging scope and attention to detail. Chemical, biological and sociological reasons behind organic gardening methods are fully explained with the obvious conclusion that it is fundamentally preferable to artificial methods.

Mail this coupon to:

**FRIENDS OF THE EARTH,
P.O. Box 39-065, Auckland West.**

Please send me copies of the
Mother Earth Manual of Organic Gardening
at the discount price of \$4.45 post free.

I enclose M.O./cheque for \$
FOE Ltd.).

Name

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Tracking opossums by radio in native bush

SINCE 1966 Ecology Division, Department of Scientific and Industrial Research, has studied opossums deep in the mixed lowland forest of the Orongorongo Valley, near Wellington. One useful technique was to fit two male and two female opossums with miniature radio transmitters and to track them for 3 nights a month for 2 years. During this period over 3000 radio fixes were made, from which much information was gained on the behaviour of opossums and a good deal discovered about their movements and home range.

**By G. D. Ward,
Ecology Division,
Department of
Scientific and
Industrial Research**

HAND-HELD aerials, which made it possible to approach each opossum closely, were used to track the animals. After the first 2 or 3 months the animals became accustomed to regular visits at night and showed no apparent concern.

Opossum dens

Opossums nearly always chose to den in large trees. Northern rata was the most favoured species, but hinau and pukatea were also popular, especially those carrying heavy loads of kiekie, astelia, and other epiphytes or having holes in the trunks and branches.

The four radio-tagged opossums seldom denned on the ground. Each animal used from 4 to 10 dens in each year of the study. Some sites were more favoured than others and used throughout the 2-year period; some were used often for a few months before losing favour and others were used only once or twice.

There was no seasonal trend in the use of any one tree species for denning, and choice of site was little influenced by the part of the range used dur-



D.S.I.R. photo

The transmitters carried by the opossums operated on discrete frequencies in the 27 MHz band. Each weighed 55-60 g (about 2 oz) and had an operating life of 5 months. They had no noticeable effect on the behaviour of the animals.

ing the previous or following night. However, animals often changed their dens when making large shifts in range. Checks were made to see if the animals shifted from one den to another during the day, but no such movements were recorded.

No evidence of territories

In Australia male opossums keep individual territories, and the ranges of females overlap, but we obtained no evidence that male opossums in New Zealand bush have territories. No patrolling or fighting along boundaries was seen.

The animals moved freely about the bush and made excursions without any apparent opposition from their neighbours, and, though generally solitary, they were often seen feeding in groups of two or three and occasionally in larger numbers on seasonally and locally abundant foods. No evidence suggested that opossums maintain a pair bond.

Home range

The term "home range" is used to describe the area that an animal occupies or crosses in pursuit of its needs. This term is quite distinct from the idea of territory, which refers to an area that is defended against other animals.

Once the radio-tagged animals became active in the evening, their locations were checked hourly, usually to the nearest metre, and the resulting plots were used to estimate the size of their ranges (see the table at right). During a single night the animals usually limited their movements to an area of less than 1000 sq m (about a quarter of an acre).

This nightly exploitation of such a small area suggests that their resources were very concentrated and there was little need for them to travel far. However, the opossums did not always use the same area from night to night, and certainly shifted ground from month to month.

In considering the home ranges of animals the period of observation must always be taken into account, for the longer the animals are watched, the larger their home ranges become. Thus though the opossums usually confined themselves to less than 1000 sq m a night, they ranged over about 2300 sq m in 3 nights, 5740 sq m (1.4 acres) per 3-month season, and about 14 300 sq m (3.4 acres) per year.

Excursions of 200 m or more were made to feed on locally abundant foods, and in the breeding season males travelled similar distances to mate. The excursions are shown in the diagram, with the average nightly range of each animal (circular area) for each year for comparison. The opossums commonly made their excursions within an hour or two of leaving their den trees and usually remained at the source of attraction for 2 to 4 hours before returning. Attractions included beech

flowers and seeds, scabweed on the river bed, kamahi flowers, and hinau fruits.

These movements are not exceptional, but the four animals used in the radio-tagging programme were mature adults. Had young males been tagged, greater movements would probably have been recorded, as a separate study in the Orongorongo Valley has shown them capable of dispersing several kilometres through the bush.

During wet weather opossums generally restricted their movements. They did not make excursions when it was raining hard or when the canopy was dripping heavily, but some made excursions on fine nights which later turned wet, and twice an animal travelled a fair distance from its central area during a break in wet weather only to return when further rain set in. Sudden downpours always caused the animals to take refuge immediately in the nearest shelter, though they usually returned to regular dens before daybreak.

Feeding

Radio tracking of opossums has thrown some light on the animals' feeding behaviour. Hinau, rata, and kamahi were

Average nightly, 3-nightly, seasonal, and annual home ranges of each opossum for each year and the 2-year ranges

Animal	Year	Average nightly range (sq m)	Average 3-nightly range (sq m)	Average seasonal range (sq m)	Average annual range (sq m)	2-year range (sq m)
Female A	1	818	2 821	5 221	9 800	25 000
	2	615	2 938	4 805		
Female B	1	459	1 512	4 362	8 500	17 500
	2	129	590	1 268		
Male A	1	822	3 258	10 212	27 100	46 600
	2	677	2 849	10 010		
Male B	1	758	2 133	5 188	11 900	21 500
	2	849	2 293	4 870		

the most frequently used trees over the 2-year study.

During the first year black and hard beech flowered exceptionally well and hard beech, pigeonwood, and horopito bore abundant seeds and fruit. The opossums frequented these trees in the first year, but paid little attention to them when they flowered and fruited much less abundantly in the second year.

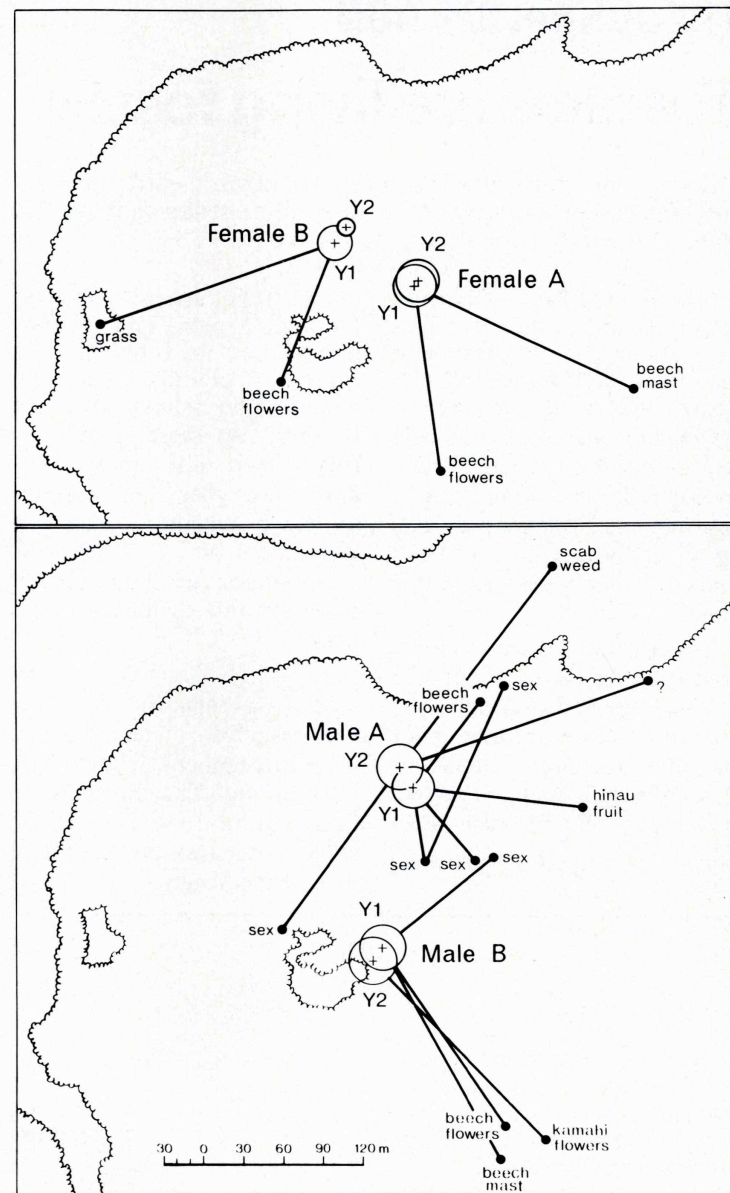
This change in food resulted in fewer excursions in the second year and almost certainly accounted for the decline in condition of three of the animals in the final autumn and winter—a trend also seen in the rest of the population.

Timing of nocturnal activities

The opossums usually became active during the hour before sunset, and most left their den trees in the hour after sunset. Even in continuous heavy rain no animal remained in its den tree for longer than 5 hours after the onset of activity. Most returned to their den trees within 3 hours before sunrise, but they were occasionally forced to return earlier by heavy rain. Between November and April there was a distinct halt in the activity of opossums about an hour before sunrise, but during the rest of the year animals often remained intermittently active 2 or 3 hours after sunrise.

Future work

An improved transmitter which incorporates a microphone has now been developed to track the animals as before and also to record what each animal is doing. The signals from each transmitter are received at the nearby field



The direction, distance, and cause of the major excursions undertaken by each animal each year (Y1, Y2). The circles are equal in area to the average nightly range size of each animal and are drawn around the centres of their annual ranges.

station and displayed on a chart recorder. These traces are then used to identify the activity of each animal.

Particular emphasis is being given to determining when and for how long opossums feed and to learning how this essential activity is influenced

by weather, the opossums' condition and breeding status, and the availability of preferred foods. This work will lead to a closer understanding of opossum behaviour and eventually contribute to their successful control and management.

THE JUNIOR SECTION*

Tuataras are living fossils

MOST of us think that tuataras are lizards, but they are not; they are survivors of a race of reptiles 200 000 000 years old—living fossils.

By Roger Chorlton

OTHER reptiles such as snakes, lizards, and crocodiles have changed and spread into the many world-wide species known today, but the tuatara, *Sphenodon punctatus*, the sole representative of the Rhynchocephalia or “beak-heads”, has remained unchanged. The tip of its upper jaw is beak shaped, which gives rise to this name.

These creatures were widely spread about the world in the Triassic period. Today the tuatara is found on only about 30 small off-shore islands of New Zealand. They are in two areas, one off the east coast

*Sponsored by the J. R. McKenzie Trust.

of the North Island, including the Poor Knights and Mercury groups, and the other in Cook Strait, including Stephens Island, Trio Island, and The Brothers. As these islands are rugged and cliff bound without landing places and exposed to rough weather, few New Zealanders get the chance to see tuataras in their natural state. Permits to land are also needed.

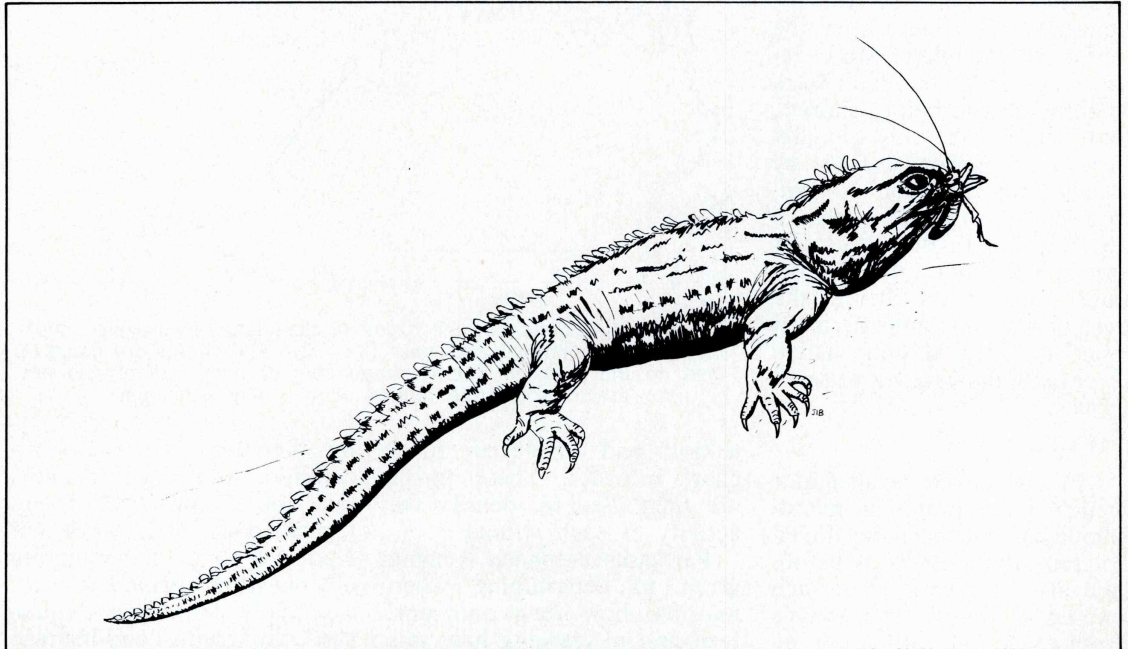
Dr W. H. Dawbin, who has written a scientific study of tuataras, has made over 20 trips to Stephens Island, Trio Island, and The Brothers in Cook Strait. I have helped capture tuataras on several of these expeditions.

The tuatara's year

Dr Dawbin has found that in winter tuataras hibernate to some degree. A few bask in burrow entrances on sunny days and some hunt food in the daytime too, but they are mainly nocturnal (active at night).

In August they are more active in coming out of their burrows.

Egg laying occurs from October to December. The female lays from 8 to 15 eggs in a special, shallow nest pit. The eggs have leathery skins like a snake's egg. The nest is



A tuatara with a captured weta.

filled in by the female and she pays the eggs no further attention.

Hatching takes place at least a year and up to 15 months after laying. There is an unusual period of hibernation in the egg during winter when no growth takes place. This could account for the varying times eggs take to hatch because of the varying cold of different winters.

The young tuatara has a horny egg-breaker, on the tip of the nose, which it uses to slit the skin of the egg. The egg-breaker drops off a few weeks after hatching. There is a pineal or "third" eye in the middle of the forehead which is most prominent in the first 6 months of life, being overgrown later with opaque scales. No use has been found for this organ, which also exists in some lizards and other animals.

The sexes are distinguished by the greater size of the male and its larger crest and heavy jowl (the loose fold of skin below the jaw). Males seem to be more venturesome than females; they sunbathe more in the day and hunt more freely at night. Only during misty rain after a dry spell do females appear as frequently as males.

In museums there are more males than females probably because they are seen more frequently or possibly because they are larger and look more impressive as specimens.

A visit to Stephens Island

Stephens Island, about a square mile in area, lies to the north of D'Urville Island in stormy Cook Strait. It is reached only by lighthouse tender or local launch.

On a trip I made to the island, when we arrived at the

small village at French Pass, on the mainland opposite D'Urville Island, it was too rough for the launch to attempt the crossing; so we had to camp in the wharf sheds overnight.

Next morning we made an early start at 6 o'clock without breakfasting, to take advantage of the improved weather. After several hours of steady plugging up the east coast of D'Urville Island and tossing about in the open strait on the final stretch, we lay off the north-western end of Stephens Island, where the lighthouse is situated.

The keepers came down to help us land at the block on the eastern side. After a short wait we were ferried ashore in a small dinghy one at a time.

The packs and stores were swung aloft by a crane and landed on top of a 30-ft-high block of concrete. Because the waves break high over this block in storms, the crane machinery must be rugged. From here the steep cable tramway was used to haul our gear to the easier slopes at the top of the island. From the engine house a tractor took the load to the lighthouse village.

Mr Gary Schroder, the chief lighthouse keeper, and Mrs Schroder were very hospitable to us during our stay. We were housed in comfortable quarters next to the lighthouse.

Studying tuataras

The rate of growth of tuataras, which are long-lived creatures, is being studied. Knowledge of growth rates of different-sized animals makes it possible to estimate ages of the island's population. Rate of increase or decrease in numbers is judged over a period of years, and steps to protect a

falling population can therefore be taken if needed. So far the tuataras seem to be holding their own on rat-free islands such as Stephens Island.

Habits of feeding and breeding are observed and a study of the effects of temperature changes on tuataras is made.

Over 750 animals have been marked during the last 28 years on more than 20 visits.

As the animals are active and come out to hunt for food at night, teams capturing them have to work at night too.

In recent years individual tuataras have been fitted with thermometers and mini-transmitters to signal changes in their body temperatures. Directional receivers allow the animals to be found readily. Tuataras can endure a wide range of temperatures from 7°C at night, when they are feeding, to up to 40°C for a while when they bask near their burrows in the sunlight.

A night hunt

Here is how a night hunt goes: Our first hunt is typical of those for 6 successive nights on the island. We are given areas of about a hectare to cover in two-man teams.

We set off at dusk just as the beams from the lighthouse are flashing out from the high tower. We are all well muffled up against the wind constantly blowing on this exposed place, 180 m above the sea. We have checked our torches and packed spare batteries. (The party used about 200 cells during its week of hunting.)

The white of fairy prions, *Pachyptila turtur*, coming in to land is fitfully revealed in the lighthouse beams as we walk down the track. The prions are little petrels the size of pigeons whose nest

burrows riddle the ground on the upper slopes of the island.

Petrels of several species are always found on tuatara islands and share burrows with tuataras. The numbers of burrows in some places are so great that you cannot walk on the surface without sinking into a collapsing burrow every few steps.

Insects abundant

The soil is so churned and mixed with guano that insect life is very abundant. Many wingless insects such as wetas are eaten by tuataras and this is thought to be one link between petrels and tuataras.

Adult prions are away at sea during the day, feeding on shoals of fish, and return to the nest and nestlings only at night. The chicks remain in the burrow until they have lost their cute, downy coats and become fully feathered. Some of the burrows are used by tuataras even while the parent birds are incubating eggs. The relationship between these very different creatures is not fully explained.

Eggs and chicks are sometimes taken by tuataras and even adult birds may have their heads pulled off and eaten. Headless carcasses of prions are not uncommon in the burrow areas. However, many tuataras make their own burrows and live on their own.

Careful! They bite!

Though they are not usually vicious, tuataras can scratch and give you a nasty bite. You need to be careful in handling them. I have handled hundreds and been bitten only twice.

The first time it was a nip through the bag containing several tuataras and the clothes on my back. I let go the bag in a hurry, but it still hung on my back, pinned there by the



The author holding a tuatara on Stephens Island. This sketch was copied by Mrs J. Mann from a photograph.

tuatara's jaws! The second time, when my finger was grabbed, was more painful. It took some time to force the vice-like jaws apart and free a sore finger.

When picking up the animal, it is wise to grasp it by the back of the neck and hold it firmly to avoid the claws.

Recovering marked animals

Permanent marking is done by removing one or more claws in a coded system. It is not painful and does not harm the animal. Recovery of animals captured on previous visits is essential; so a system like this is needed. Temporary marking for the week of the visit is done with nail varnish. Claw-marked animals are released later where they were captured.

Some of the tuataras have been repeatedly caught and given nicknames. "Horrible Horace" was one that lived in one of the keeper's gardens. He was very large and old, about 60 cm long, and perhaps 100 years of age. Like tortoises and turtles, these animals live long and do not breed until they are about 20 years old or more.

For several hours we trudge back and forth across the slopes looking for tuataras. Their earthy colour and habit of pausing, motionless, between sallies after insects make them hard to see at first. Then we regain the knack of spotting them, picked up on previous trips. We capture and bag several large claw-marked animals.

The white beams of several lighthouses sweep around the sky and the chill wind is ruffling the grass. Then a soft feathery bundle hits me in the face. Startled, I crouch down and then relax. It is only a fairy prion off course.

It is midnight and time to knock off. We trudge back wearily with our bag of tuataras, put them carefully on the bench for examination, and then enter the hut for a cup of tea and a night's rest. Next day, we can fish, swim, or sunbathe in peace.

Other inhabitants

As well as the tuatara, the island has other rarities. The tiny Stephens Island wren, *Xenicus lyalli*, is gone, wiped out in 1894 by a lighthouse keeper's cat, but the rarest of our three native frogs, *Leiopelma hamiltoni*, is still there, holding on to a risky existence. It is now found only in a small boulder bank at the top of the island laid bare of the previous blanket of bush.

The Wildlife Service has successfully replaced some of the shelter by planting taupatas and other native species to keep the bank moist. The frogs cannot exist without some moisture on their skins. Their species has recently been bred in captivity for the first time by Dr Ben Bell (see page 12).

One of the giant wetas, *Deinacrida rugosa*, is another rarity. It is also present on

Middle Trio and Maud Islands. As it is eaten by tuataras, its existence is threatened and it may have to be established on another, tuatara-free island.

The native snail *Rhytida stephenensis* exists only on this island. It is not easy to find in dry seasons. The snail has to burrow well down to keep moist. Some are found in the

boulder bank with the frogs.

The Wildlife Service is taking steps to protect all these rare survivors of groups that have changed very little in the last 200 000 000 years. The changes wrought by modern man on this tiny island could otherwise mean the end of several more of our vanishing species.

Things to do

1. If you live near a zoo, see if it has a tuatara. Wellington Zoo has a tuatara in its reptile house, but it is not on display at present, as it has not been well.
2. See if your local museum has a stuffed tuatara that you can study.

Winter flowers and fruits are colourful

WINTER is a time of rain and mud, drab skies, and bare trees. The pulse of nature is at its lowest ebb. Nothing much to see in the bush just now, you might say. But is this really so? If you keep your eyes open on your bush walks, you will be surprised at how much is happening around you.

THOUGH autumn has been called poetically the "season of mists and mellow fruitfulness", several of our native trees have flowers and fruits in winter, not autumn.

Flowers

Alseuosmia macrophylla or New Zealand honeysuckle flowers throughout winter, and its delightful perfume can be smelt over some distance. The bell-shaped flowers are on stalks, either singly or up to four together, in all shades from pinkish cream to crimson. The fruit is an oblong crimson berry about 1 to 2 cm long.

The kohekohe (*Dysoxylum spectabile*) is a handsome, medium-sized tree with large glossy leaves. The flowers are in long delicate sprays of creamy white and arise from the trunk or bare branches. The spectacular fruit is ripe at the end of winter, when the greenish parchment covering opens to show half a dozen seeds with a bright red coating. Look for this tree in North Island coastal forests.

Watch for the delicate, sweetly scented clusters of small green flowers on the five-

By Joan Beu

finger (*Neopanax arboreum*) towards the end of winter.

The puriri (*Vitex lucens*) has many dull red flowers up to 2 cm long which are pollinated by birds. It is a very handsome tree when the flowers mingle with the glossy leaves.

Fruits

Miro berries (*Podocarpus ferrugineus*), the size of a small plum, ripen during winter to a bright red with a delicate bloom. The native pigeons are fond of the turpentine-smelling berries and become very plump and lazy when they feed on them.

The fruits of the kahikatea (*P. dacrydioides*) ripen in May. The small jet black nut is borne on a red fleshy swelling, which was eaten by the Maori.

Birds are fond of the berries of the broad-leaved cabbage tree (*Cordyline indivisa*) of the North Island and Westland. Though this cabbage tree flowers in summer, its berries are not ripe until winter.

Pigeonwood (*Hedycarya arborea*) has seeds that ripen over about 9 months, and the juicy, red, cherry-sized berries are an important winter food for pigeons.

The kaikomako or bellbirds' food tree (*Pennantia corymbosa*) has small juicy purple drupes that the bellbirds love.

Schefflera digitata has clusters of black juicy drupes along narrow spiky sprays.

Hinau (*Elaeocarpus dentatus*) has a grey drupe with a stone like an olive. After suitable treatment the flesh of this seed was made into a sort of bread by the Maori.

The native passion fruit (*Tetrapathea tetrandra*) has a bright orange, oval fruit about 2 cm across which ripens early in winter. You will find this creeper in bush as far south as Banks Peninsula.

Most of the *Coprosma* berries will have dropped by winter, but you may find small glistening fruits on some species.

Flowering and seeding are but two of a number of events to note during winter. When you have kept a record of seasonal changes and events for several years, you will be able to anticipate the seasonal patterns. For example, if you know which trees will be in fruit at a particular time, you will know where to go to watch birds.

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INC.

(FOUNDED 28 MARCH 1923)

PATRONS

His Excellency The Governor-General of
New Zealand, Sir Denis Blundell,
C.G.M.G., G.C.V.O., K.B.E.

Her Excellency Lady Blundell
Representative of the Maori Race,
The Right Rev. the Bishop of Aotearoa

PRESIDENT

A. A. T. Ellis*

DEPUTY PRESIDENT

N. E. Dalmer*

TREASURER

R. Tilbrook*

COUNCIL

Lt.-Col. F. A. Bishop*	S. B. U. McKenzie*
Mrs N. Bishop	Dr G. W. Mason
A. Caccia Birch	A. M. Maunder
B. A. Calder*	Mrs M. Neilson
Prof. V. J. Chapman*	R. C. Nelson
K. Downing*	J. Newton *
Mrs D. Du Pont	I. R. Nimon*
Mrs A. Eagle*	K. E. Reynolds
Mrs D. B. Goile	P. Rider
A. S. Gray*	F. B. Ross
L. E. Henderson*	V. Sale
Miss L. Hodgson	P. Sinclair*
G. Horn	A. I. Southgate
R. C. G. Janes	Dr M. Taylor
J. V. Jerram*	B. Teague
J. Johnstone	I. Thacker
S. R. Kennington	Mrs M. F. Thorburn
Dr N. C. Lambrechtsen*	D. J. Underwood*
D. I. Lamont	Dr K. E. Westerskov*
E. Lennie	A. R. White
H. Lyall	A. Young

*Member of Executive

National secretary: Mrs Olga Langford
National conservation officer: David Collingwood
Administration assistant: Peter Redward

VICE-PRESIDENTS

Mrs H. L. Briffault	L. W. McCaskill
Mrs D. Du Pont	Mrs P. Moncrieff
Sir Robert Falla	R. O'Regan
L. E. Henderson	R. C. Nelson
Dr C. Hughes-Johnson	B. Teague

HEAD OFFICE

Fourth Floor, 292 Lambton Quay, Wellington
Postal Address: P.O. Box 631, Wellington
Telegraphic Address: "Forestbird"
Phones: 726-254, 728-154

BRANCHES

AUCKLAND: Chairman, Prof. V. J. Chapman. secretary, Mrs M. Gilpin, 11 Gunson Road, Mt Wellington, Auckland 6.

CANTERBURY: Chairman, M. C. Cullen; secretary, Mrs J. A. Empsom, 65B Wychbury Street, Christchurch.

EASTERN BAY OF PLENTY: Chairman, A. Milne; secretary, Mrs A. Woolley, 68 Douglas Street, Whakatane.

FAR NORTH: Chairman, T. Crouch; secretary, E. H. Biggs, P.O. Box 30, Mangonui.

GISBORNE: Chairman, A. Webster; secretary, Mrs S. Johnson, P.O. Box 802, Gisborne.

HASTINGS-HAVELOCK NORTH: Chairman, J. R. Nimon; secretary, D. H. Sherning, P.O. Box 222, Havelock North.

HOROWHENUA: Chairman, A. M. Maunder; secretary, R. A. Wilde, 1 Oriel Place, Levin.

KAPITI: Chairman, W. Cranson; secretary, W. J. E. V. Grace, 3 Camellia Grove, Parklands, Waikanae.

MANAWATU: Chairman, Dr N. C. Lambrechtsen; secretary, M. MacDonald, 37 Newbury Street, Palmerston North.

MARLBOROUGH: Chairman, N. Campbell; secretary, Miss M. B. Astbury, 24 John Street (Flat 3), Blenheim.

MID NORTH: No officers appointed yet.

NAPIER: Chairman, P. R. Magill; secretary, Miss H. A. Timms, 29 Colenso Avenue, Napier.

NELSON: Chairman, A. R. White; secretary, J. L. Crawford, 95 Queens Road, Nelson.

NORTH SHORE: Chairman, J. Johnstone; secretary, O. Raskin, 32 Holland Road, Northcote, Auckland.

OTAGO: Chairman, Dr K. E. Westerskov; secretary, Miss L. N. Paton, 362 Moray Place, Dunedin.

RANGITIKEI: Chairman, K. E. Reynolds; secretary, Miss D. J. Straugh, 93 Pukepapa Road, Marton.

ROTORUA: Chairman, Dr M. D. Wilcox; secretary, Mrs E. M. Abernethy, 83 Devon Street, Rotorua.

SOUTH AUCKLAND: Chairman, A. Young; secretary, Miss N. Dare, 13A James Road, Manurewa, Auckland.

SOUTHERN HAWKES BAY: Chairman, Mrs P. Menzies; secretary, Mrs J. R. Drake, 170 High Street, Dannevirke.

SOUTHLAND: Chairman, D. J. Lamont; secretary, Mrs D. J. Lamont, Pinebush, R.D. 5, Invercargill.

TARANAKI: Chairman, Miss M. Macklin; secretary, Mrs G. M. Elliott, P.O. Box 600, New Plymouth.

TAUPO: Chairman, H. Aldworth; secretary, Mrs E. Gundry, 29 Mere Road, Taupo.

TAURANGA: Chairman, T. Southon; secretary, R. C. G. Janes, 534 Fraser Street, Tauranga.

TIMARU: Chairman, F. B. Ross; secretary, Mrs K. Pilbrow, 32 Pages Road, Timaru.

UPPER HUTT: Chairman, R. Stack; secretary, Mrs A. E. Palmer, 230 Fergusson Drive, Silverstream.

WAIKATO: Chairman, Mrs A. L. Eagle; secretary, K. A. Mayhill, P.O. Box 9365, Hamilton.

WAIRARAPA: Chairman, Mrs J. Pederson; secretary, J. Newton, 28 Jellicoe Street, Greytown.

WAIROA: Chairman, E. J. Swan; secretary, Mrs N. W. Bishop, 25 Crarer Street, Wairoa.

WANGANUI: Chairman, S. B. U. McKenzie; secretary, Mrs I. Wilde, 32 Fox Road, Wanganui.

WELLINGTON: Chairman, Lt.-Col. F. A. Bishop; secretary, Mrs G. Tanzer, 41 Howard Road, Point Howard.

WEST COAST: Chairman, P. Sinclair; secretary, D. Horne, C/o Kumara State School, Kumara.

SECTIONS

KING COUNTRY: Chairman, J. Aston; secretary, not yet appointed.

LOWER HUTT: Chairman, C. Pell; secretary, Miss J. Ainslie, 3 Meadows Avenue, Lower Hutt.

MANA: Chairman, C. de la Cour; secretary, P. Bowen, 2 Stephen Street, Tawa.

SOCIETY'S LODGES AND HOUSES

Tautuku Lodge

Situated 45 miles from Balclutha on State Highway 92, Tautuku Lodge on the Society's 1,360-acre bush-clad Lenz Reserve in coastal south-east Otago is the place for that weekend or holiday in beautiful peaceful, unspoilt surroundings.

The reserve has interesting bush walks, and native birds are numerous. The round track is a comfortable 4 hours' walk, and as this is in its formative state, visitors are requested to keep to the marked track route.

The lodge is fully equipped and accommodates eight or nine people. It has a lounge, kitchen, two bunkrooms with innerspring mattresses and foam rubber pillows, washroom with tub, basin, and shower; and an ablution block with toilets, basins and showers. Charges are moderate, as shown below.

The cooking facilities in the modern kitchen are excellent.

Bring with you all food supplies, bed linen, and pillow cases, blankets, towels, tea-towels, etc.

Bookings are accepted up to 9 months in advance. No refunds are made unless cancellation is advised at least 1 month before reserved occupancy.

Rates per night are:

Senior members, \$2.50*.

Junior members, \$1.

Senior non-members, \$4.

Non-members (5-17 years of age), \$1.50.

A deposit of 50 percent is to be made with each booking.

For fere brochure and all bookings apply to Mrs F. B. Bennett, Papatowai, R.D. Owaka. Telephone 160M.

Turner Cottage

The Turner Cottage, on Stewart Island, is available for renting. The cottage, a one-roomed dwelling furnished for three people, can be obtained at a rental of \$4 a day for members and \$6 a day for non-members.

For details write, enclosing a stamped addressed envelope, to:

"Turner Cottage", P.O. Box 1155, Invercargill.

Bushy Park, Kai Iwi

(15 miles north of Wanganui)

Fine old homestead, lovely grounds, 220 acres of native bush.

Make your own programme. Electric stove, hot water, and other facilities available. Bring your own rates. Bedding supplied. Linen and towels \$1 per bed.

Fees: Members, \$4 per night; non-members, \$5 per night; children under 15, half rates.

Custodian: C/o Bushy Park Homestead, Post Office, Kai Iwi, via Wanganui. Telephone 49-734, Wanganui.

The park is closed to daytime visitors on Mondays and Tuesdays.

Ruapehu Lodge

Ruapehu Lodge is available to members and guests for occupation. To avoid double booking all bookings must be made with the Society's head office, P.O. Box 631, Wellington.

Fees: Winter season (1 June to 31 October), \$3.50 per night for all persons of all ages.

Summer season (1 November to 31 May), adult members, \$2.50; junior members, \$1.50; non-member guests, all ages, \$3.50.

Bookings: Bookings may be made by members, sections, and branches 9 months in advance.

A deposit of 20 percent (70c per person per night) is payable on application and the remainder not later than 6 weeks before occupation. The full amount has to be paid with bookings made within 6 weeks of occupation.

If bookings are not confirmed by the due date, the space may be relet.

Refunds are subject to \$10 surcharge.

The deposit receipt will be returned with an instructions sheet listing suggested equipment which should be taken on the trip: Tea-towels, torch, sleeping bag, blankets, sheets, and slippers or light shoes. A pillow case is essential.

The wearing of boots inside the lodge is not permitted. No animals or pets are allowed in the park.

Any person occupying the lodge without prior booking must immediately remit the proper fees to the booking officer.

Waiheke Island Cottage, Onetangi

The cottage has comfortable bunk accommodation for eight people and has electric lighting, stove, refrigerator, and hot water. Adjacent to a 121-acre wildlife reserve, it is an easy walk to shops and the beach. It is reached by ferry from Auckland City (two or three return trips daily) and by bus or taxi from the island ferry wharf. Everything is supplied except linen and food. **No animals are permitted.**

Summer (mid-October to Easter, inclusive)

Nightly (not weekends): \$2 per person per night.

Weekends: \$12 minimum. More than 2 adults, \$2 per person per night.

Weekly: \$30 minimum. More than 2 adults, \$2 per person per night.

Winter (after Easter to mid-October)

Nightly (not weekends): \$1.25 per person per night.

Weekends: \$12 minimum. More than 3 adults \$1.25 per person per night.

Weekly: \$20 minimum. More than 2 adults, \$1.25 per person per night.

Children 15 years and under: First two, half rates; others, no charge.

A deposit of 50 percent is payable on booking, the remainder before entry.

Booking Officer: Mr K. A. Lake, 40 Kildare Avenue, St Heliers, Auckland 4. Telephone 558-859.

* All charges on this page are subject to alteration from time to time.

A FOREST IS MORE THAN TREES

A forest, young or old, large or small, native or exotic, is home to countless varieties of plant and animal life. It also filters pollution from the air, helps keep oxygen and nitrogen in balance, protects the ground from heavy rains which cause soil erosion, and provides insulation from heat and cold. Forests may also provide a renewable source of wood and all its by-products.

Flower fungus (Aseroe rubra)



Fungi aid the natural cycle of decay and renewal in a forest community. They break down the elements of which living things are made and return these to the soil and air so they can be used again by new plant life.

The spores of the flower fungus (*Aseroe rubra*) are contained in a sticky evil-smelling mucus. This attracts swarms of flies which feed on it and then carry the fungi spores to new places.



The New Zealand Forest Service.

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED

ANNUAL REPORT

FOR THE YEAR ENDING FEBRUARY 28, 1977 BEING THE FIFTY- FOURTH YEAR OF THE SOCIETY

To be presented at the Annual General Meeting to be held in the Professional Club, Kitchener Street, Auckland, at 9.15 a.m. on Saturday, June 18, 1977.

ORGANISATION

The Society's Executive has pleasure in presenting the Annual Report and Statement of Accounts for the year ended February 28, 1977.

The total membership passed the 24,000 mark in February. This figure, of course, includes many family groups. It is noteworthy that an independent research announced at the Environment '77 Conference in Christchurch showed that our Society was itself larger than the total of all other New Zealand conservation groups added together.

We now have 32 Branches spread throughout New Zealand and during the year the South Auckland Section and the Upper Hutt Section were promoted to full Branch status. In February 1977 the new Mid-North Branch was formed at Wellsford. We warmly commend the Auckland and Wellington Branches on promoting these new Branches.

We hope that other Branches will form Sections in areas of large population as this brings more people into our active conservation role and enables more positive action in local environmental issues.

The President has visited and addressed Branches, attended conservation meetings and expanded the contacts of our Society.

The National Conservation Officer has addressed all but two Branches, and has given many addresses to kindred organizations. He has made our submissions to Select Committees of Parliament, has inspected forests throughout New Zealand, and has written to Ministers and appeared on radio and television on a wide range of matters of environmental concern. He has assisted Branches and Sections to cope with local conservation throughout the year.

ADMINISTRATION

The Society's 18% growth throughout the year has been a heavy burden, and coming as it does with the inflationary trends, a careful management of the Society and its expenses has been called for.

The Head Office staff under the continued capable leadership of the National Secretary has maintained an efficient control of the Society's affairs. The staff changes throughout the year were the retirement of Mr Arthur Reeve, Public Relations Officer, in December, and the appointment in January of Mr Peter Redward as Administration Assistant to both Mrs Langford and Mr Collingwood.

Our former president over the years, Mr Roy Nelson, continues to take an active interest in the work of the Society.

SOCIETY LODGES AND RESERVES

Our Ruapehu Lodge continues to be most popular, many Branches availing themselves of its facilities during the year, and indeed our Society's 1976/77 Annual Camp taking place there. After many years of outstanding service as voluntary wardens Mr and Mrs Fagan have given up the onerous work they had so willingly undertaken. It has been necessary to organize a system where Society members undertake warden duties at weekends to ensure that care is taken of the facilities. It may be possible to appoint a full time warden and caretaker in the future.

Our property at Bushy Park has had a good year—day visitors have increased by 30% and accommoda-

tion has continued at the same level as previously, and our custodians, Mr and Mrs Studd have maintained the high standard of the house and grounds. During the year twenty-five wekas and five kiwis were liberated in the 101 ha. of bush. Fencing and surveying for the wetlands development continued during the year, and planting of suitable native trees is about to commence. We were most grateful for a grant from the Dudding Trust, which was used to update the stables, and a small grant towards fencing was received from Sport and Recreation. The Governor General and Lady Blundell, Patrons of our Society, visited Bushy Park in May and unveiled the memorial to the late Mr Peter Dickson.

Tautuku, Waiheke Cottage and Turner Cottage have all been well utilized, and the Society is most grateful for the work of the respective Branches which administer them.

ANNUAL CAMP

Waikato conducted the annual camp in January at Tongariro National Park, utilizing our own and three other lodges for the purpose. Over two hundred Society members attended. The Society's Executive congratulates the Waikato Branch on this most successful camp.

SUPPORT OF MEMBERS

The work of the Society is prospering through the work of members throughout New Zealand and the level of donations and support of appeals has been most heartening to your Executive.

MAUD AND MANGERE ISLAND APPEAL

The Society raised \$25,000 and was able to secure the purchase of Maud Island, and by its timely financial assistance was able to aid the rescue of the last Black Robins from Little Mangere Island. It is heartening to know that they are now breeding in their new habitat.

THANKS

We thank the news media for their valuable assistance and interest in our Society, and the various Government Departments for their understanding of the many problems we tackle and their willingness to consider our views and the friendly co-operation shown. FINALLY we thank our Branch and Section Committees and all members of the Society for their continued support and the increasing work they are undertaking in the conservation and protection of our beautiful country.

OBITUARY

DR J. S. ARMSTRONG The sudden passing in February 1977 of Dr Armstrong, a Vice President of the Society, came as a great loss to his many friends and to the Society. He had been an esteemed member of the Taupo Branch over many years and had done much to foster the society in its formative years.

FINANCE

The past year has been one of rising membership and increased interest rates, both contributing to a substantially increased gross income. It is, of course, necessary to manage our resources on a continuing basis, to keep adequate cash on hand to meet immediate needs, and at the same time, obtain the maximum return possible on idle funds subject to trustee safety requirements. At the back of our minds is the building programme which restricts long term investment.

With a view to coping with our very large membership roll an investigation has been made of various computer systems, the object being to contain costs. In another direction, with a view to increasing efficiency throughout the Society, encouragement has been given to the production of the Training and Organisation Manual.

Inflation has caused large increases in expenditure, but this has been greatly alleviated by our increased subscriptions. Both Bushy Park and Ruapehu Lodge cause concern with a working loss on the one hand and Park Board building and fire precaution requirements on the other. Thanks are due to those volunteers who have spent their time looking after both these two fine assets and the other reserves throughout New Zealand.

Our head office staff give tremendous service. It will probably be necessary to provide increased assistance this year, particularly in the conservation field.

Our aim will continue to be to provide the financial muscle to further the aims and objects of your Society.

BEQUESTS

The Society was grateful for bequests amounting to \$11,280 received during the year from the following — Miss B. Fuller, Mr F. I. Dawson and Mr D. N. Wadman.

CONSERVATION- OUR MEMBERS' ROLE

During the year the Society has still further involved itself in the protection and conservation of New Zealand in accordance with the terms of its Royal Charter. The Society relies on its Branches who are responsible for local activity, as evidenced by the increased Society activity in all parts of New Zealand.

FORESTS

The past year has seen the first evidence of the Government's indigenous forest policy in its various forms. The Society made strong submissions on the Forests Amendment Act, calling for greater public involvement in forestry decision. We are concerned at forest utilization, particularly in Minginui, Horohoro, Waihaha, Karamea, Southland beech and Westland beech forests. Okarito and South Westland is a very special concern and we have taken a case against the sawmillers in the Supreme Court at Christchurch. We have called for valuable areas to be added to National Parks and we have heightened our interest in State Forest Parks and other lands as a part of New Zealand's heritage.

4. **Maud / Mangere Island Appeal Funds:** \$14544 represents the balance of funds not yet passed on to the Government and which have been received by the Society in response to an appeal in February 1976 made for the purposes of:
- (a) Assisting the Crown to purchase Maud Island in Pelorus Sound.
 - (b) The revegetation of Mangere Island in the Chathams.

5. **Restricted Funds**

These are vested in the Society for specific purposes and are not available to be used by the Society at its own discretion for its general objects.

- (a) **Sutherland Trust Fund** - An endowment from the late Archibald Sutherland to provide for the maintenance in perpetuity of bush left by him in the care of the society.

	\$	Represented by:	\$
Original Capital	30832	Trustee Debenture Investment	30832
Accumulated Income to 28.2.77	10448	Advance to the Society	10448
	<u>41280</u>		<u>41280</u>

- (b) **Hastings and Havelock North Branch** - Funds held in trust by the Society on behalf of its Hastings and Havelock North Branch for expenditure on the aims of the Society in the Hawkes Bay area.

	\$	Represented by:	\$
Masters Estate Original Capital	32850	N.Z. Insurance Co. Napier Group investment	33100
Williams Estate Original Capital	7330	Registered Mortgage Preference Shares	7250
Knapp Estate Original Capital	2500	Society's Building Fund Loan	2000
Martin Pharazyn Estate Original Capital	2000	Advance to the Society	6105
	<u>44680</u>		
Accumulated Income to 28.2.77	5775		
	<u>50455</u>		<u>50455</u>

- (c) **Building Fund** - Donations and Loans received from members to finance a future building and offices for the Society.

	\$	Represented by:	\$
Donations	26298	A & N.Z. Banking Group Limited	
Loans	54972	Deposit Account	10000
	<u>81270</u>	Current Account	7271
Accumulated Income to 28.2.77	8911	Trustee Debenture Investments	29446
	<u>90181</u>	Registered Mortgages	34000
		Advance to Society	9464
			<u>90181</u>

Loans amounting to \$54972 have been made to the Society in response to an appeal in November 1974 and are repayable in accordance with members' individual instructions. \$12932 could be repayable within 12 months and a further \$36890 is repayable within 5 years.

6. **Donations and Small Legacies**

Included under this heading are amounts from:

J. R. McKenzie Trust	\$500
J. B. Dudding Trust	\$500
Todd Foundation	\$250

Balance Sheet As At 28 February, 1977

	(1977) \$	(1976) \$	
<u>MEMBERS FUNDS (Note 2)</u>			<u>FIXED ASSETS</u>
Capital Funds	298514	281229	
Accumulated Income	9499	2740	
	<u>308013</u>	<u>283969</u>	Kent Terrace Property
		=====	Lodges - Land
			- Buildings
			Office Equipment & Furni
			Library
<u>CURRENT LIABILITIES -</u>			
Accounts Payable	17150	8016	
Government Grants (Note 3)	8271	7000	
Maud/Mangere Island Appeal Fund (Note 4)			
Received this year	25929		
Less Paid to Department			
of Lands & Survey	11385		
			<u>INVESTMENTS -</u>
Advance from Restricted Funds	14544	-	Trustee Executors - Mort
	26017	11404	Shares in Public Compani
	<u>65982</u>	26420	Fixed Term Trustee Deber
		=====	
<u>RESTRICTED FUNDS (Note 5)</u>			<u>CURRENT ASSETS -</u>
Sutherland Trust Fund	41280	38860	Bank and Short Term Tru
Hastings & Havelock North Branch Funds	50455	48148	Accounts Receivable
Building Fund	90181	83276	Stocks of Bird Albums
	<u>181916</u>	170284	
		=====	
			<u>RESTRICTED ASSETS (Note 5)</u>
			Investments
			Advance to the Society
	<u>\$ 555911</u>	<u>\$ 480673</u>	
	=====	=====	

2. Members' Funds

Details of movements during the year are as follows:

(a) Capital Funds

	Balance 1.3.76 \$	Movements Received \$	in Year Transfers \$	Balance 28.2.77 \$
Available for Society's general purposes and objects				
Endowment Fund	27114			27114
Reserve Maintenance Fund	50000			50000
Legacies Fund	65977	15297		81274
Life Membership Fund	38689	3700	1695	40694
	<u>181780</u>	<u>18997</u>	<u>1695</u>	<u>199082</u>
Set aside for a specific purpose.				
Sanctuary Fund	9164			9164
Sanderson Sanctuary Fund	1095			1095
Moirra Cox Memorial Fund	213		17	196
Other				
Asset Revaluation Reserve	88977			88977
	<u>281229</u>	<u>18997</u>	<u>1712</u>	<u>298514</u>

The following comments are relevant to certain of these funds:

Endowment Fund \$27114 - Proceeds of "Lucky Bird" Art Union. These funds are held and administered by the Public Trustee and are currently advanced back to the Society on interest free mortgage over the Kent Terrace property. As these amounts are identical, they have been netted off for the purpose of presentation in the accounts and last years figures have been adjusted accordingly.

Life Membership Fund \$40694 - Accumulates all life membership subscriptions received by the Society. Each year one twenty - fifth of the balance of this fund at year end is transferred to Subscriptions in the Income and Expenditure Account.

(b) Accumulated Income

Details of movements during the year are as follows:

	(1977) \$	(1976) \$
Accumulated Income 1.3.76 (Deficit 1975)	2740	(16134)
Add		
Gain on realisation of Investments	3888	
Transfers from General Capital Funds		17496
Excess of Income for Year	2871	1378
Accumulated Income 28.2.77	<u>9499</u>	<u>2740</u>

3. Government Grants - Grants have been received from the Minister of Sport and Recreation for specific purposes. The current situation is as follows:

	Balance 1.3.76 \$	Received This Year \$	Net Expended This Year \$	Balance Not Yet Expended \$
Organisation and Training				
Manual		2425		2425
Purchase Training Equipment	3000		1341	1659
Administrative Costs		5400	5400	
Staff Training Officer's Salary and Expenses	4000	5415	5228	4187
	<u>7000</u>	<u>13240</u>	<u>11969</u>	<u>8271</u>

Income and

EXPENDITURE

Office Expenses -

Rent, Light and Power	6375
Postages and Telephone	3376
Printing and Stationery	2584
Depreciation of Office Equipment	635
General Office Expenses	906

Administration Expenses -

Salaries	36177
Travelling Expenses - Secretary	2341
- Executive	5266
- Special	68
Council Expenses	3472
Accountancy and Audit Fees	2714
Miscellaneous Expenses	19

Reserves Maintenance -

Rates	260
General Maintenance	243
Insurance	62
Bushy Park - Wetlands	3500

General Expenses -

Journal Costs	16996
Less - Revenue	2684

	14312
Publicity Costs	1367
Grants to Organisation	235
Branch Allocations	5401
Insurance	447
Legal Expenses	-
Miscellaneous	670
Okarito Writ - Legal & Other Costs	4000
Junior Training	109

EXCESS INCOME OVER EXPENDITURE FOR THE YEAR

Expenditure Account For the Year Ended 28 February, 1977

(1977) \$	(1976) \$		(1977) \$	(1976) \$
		<u>INCOME</u> -		
		Annual Subscriptions	58743	52107
		Investment Income	8610	4384
	6318	Donations and Small Legacies (Note 6)	7612	2818
	2823	Administration Fees	1250	1250
	3570	Government Grants	11969	11650
	441	Miscellaneous Income	3169	1217
	562	Bird Album Sales		
		<u>Less</u> Cost of Albums	2973	
13876	13714		2197	
=====				
		Rental Income	5400	
	30237	<u>Less</u> Property Expenses	2182	
	984			
	3993	Lodges - Income	17085	3218
	146	<u>Less</u> Depreciation	1987	3438
	2989	Other Expenses	13035	
	1841			
	289		15022	
50057	40479			
=====	=====			
	362			
	499			
	91			
	-			
4065	952			
=====	=====			
		AUDITORS REPORT TO MEMBERS OF ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INC.		
		We have examined the accounting records of the Society for the year ended 28 February, 1977. Our examination was confined to records kept by the Society at Head Office.		
		Subject to the above comment, in our opinion, and according to the best of our information and explanations given to us the attached Balance Sheet, Income and Expenditure Account together with notes thereto are properly drawn up so as to exhibit, respectively, a true and fair view of the state of the Society's affairs as at 28 February, 1977 and of the Society's transactions for the year ended on that date.		
	13742			
	4070			
	9672			
	979			
	1874			
	4011			
	802			
	12			
	575			
	-			
	5000			
26541	22925			
=====	=====			
	2871			
	1378			
97410	79448			
=====	=====			
		MARKHAM & PARTNERS CHARTERED ACCOUNTANTS		
		WELLINGTON N.Z. 4 May 1977.		
			\$ 97410	\$ 79448
			=====	=====

RARE BIRD PROTECTION

The Chatham Island Black Robin and the Kakapo were assisted by the \$25,000 from our public appeal. The authorities were successfully restrained from pursuing an aerodrome proposal which would have affected New Zealand's first International Wetlands Reserve at Farewell Spit. Members have been involved in expeditions to the Chatham Islands and the outlying islands of Stewart Island and Fiordland in saving endangered birds. We embarked on a new series of fine art prints to highlight and publicize our endangered birds. The Society established an ongoing grant to Universities for bird research.

THREATS TO INDIGENOUS VALUES

The Society has reacted strongly to the threats of mining in our National Parks and Reserves and has demanded of Government that care be taken and while opposing mining in these areas has called for guidelines which will protect the indigenous values wherever mining is undertaken. In particular we are concerned for reserves and forest lands in the Waikato area and in South Westland and have actively opposed the inclusion of mining clauses when making submissions on the Reserves Bill 1977.

LAND USE

Utilization of marginal farmlands and derelict lands would be better served in the planting of a variety of exotics, particularly eucalypts for the supply of short fibre, which will reduce the need for utilization of our remnant native forests. Of particular concern is the land use in the King Country and the threat of large afforestation to supply new pulp interests in the southern King Country, and as a consequence the Society is actively engaged in identifying the indigenous forest to be protected in these areas. In Northland the Society has given qualified approval to reafforestation in large areas and is currently encouraging a logical development of port and roading facilities to protect the remnant indigenous values.

NOTES TO THE ACCOUNTS

1. Statement of Accounting Policies

(a) General Accounting Principles:

The general accounting principles as recommended by the New Zealand Society of Accountants for the measurement and reporting of income and expenditure and the financial position on an historical cost basis have been observed in the preparation of these accounts with the exception of the lodges which are stated at their most recent Government Valuation.

(b) Valuation of Assets:

Accounts receivable have been recorded at net realisable value. Stocks have been valued at the lower of cost or net realisable value. Investments have been recorded at cost. Fixed Assets have been recorded at cost or valuation less accumulated depreciation.

(c) Depreciation of Fixed Assets:

Depreciation has been charged as follows:

	Basis	Estimated Economic Life
Lodges - Buildings	Straight Line Rates	40 years
Furniture & Fittings (new)	Straight Line Rates	10 years
Furniture & Fittings (old)	Diminishing Value	

Freehold land has not been depreciated.

ENVIRONMENTAL EFFECTS OF INDUSTRY

Pollution hazards loom large as a consequence of pulp manufacture and effluent in our clear waters in many parts of New Zealand as a consequence of industry and farming. Our Branches are strongly opposing local water pollution throughout New Zealand.

ENERGY RESOURCES

The Society's policy on nuclear energy was promulgated. We are involving ourselves in the proposals for utilization of our water and natural gas resources. We are actively monitoring the progress of the natural gas lines through the North Island and the utilization of the water resources in the Tararuas and in the rest of the river system in New Zealand to protect the indigenous values in the face of the need for alternative energy sources.

NOXIOUS ANIMALS

The Society has pursued its campaign for control of noxious animals in Fiordland National Park, in the Tararuas and in other mountain systems where these animals are relentlessly changing the plant association to the detriment of soil and water conservation and our botanical and bird life. Further, the threat of the opossum, not only to our forests, but to our livestock through infection continues to be a matter of great concern to the Society.

OILED SEA BIRDS

The Society has accepted the request of the Oil Spillage Committee of Government to set up an oiled sea bird warden system around the coasts of New Zealand. This is an expensive exercise and it is hoped that oil exploration and sea transport companies will join in supporting the Royal Forest and Bird Protection Society in this very costly ongoing responsibility in the protection of our diving and wading birds under the modern threat of oil pollution.

G. A. T. ELLIS, President